Monitoring Cruise at the
New London Disposal Site
August 2000

Disposal Area Monitoring System DAMOS

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13. ABSTRACT

Under the Disposal Area Monitoring System (DAMOS) Program, Science Applications International Corporation (SAIC) conducted an environmental monitoring survey at the New London Disposal Site from 10 to 13 August 2000. Field operations were concentrated over the Seawolf and US Coast Guard Academy (USCGA) disposal mounds, as well as the New London 1991 (NL-91) and Dow/Stonington (D/S) mound complex. The August 2000 field effort consisted of collecting precision bathymetric and Remote Ecological Monitoring of the Seafloor (REMOTSÒ) sediment-profile photography data. These survey techniques were used to determine whether there were any significant changes in seafloor topography over the Seawolf mound or the NL-91 and D/S Mound Complex, as well as to characterize the benthic recolonization status of all three of the surveyed dredged material disposal mounds.

The NL-91 and D/S Mound Complex is a historic sediment deposit on the NLDS seafloor located within the US Navy submarine corridor established near the center of the disposal site. This subtle bottom feature is composed of material dredged and disposed during the 1991 and 1992 disposal season. Several previous REMOTSÒ sediment profile photography surveys have served to demonstrate that the mound complex has been successfully recolonized by benthic organisms since its creation in 1992, while previous bathymetric surveys have indicated a need to increase the thickness of the capping dredged material (CDM) layer over the mound complex. Since the 1996-97 disposal season, over 30,000 m3 of supplemental CDM has been placed over the NL-91 and D/S Mound Complex as a part of a cap augmentation plan.

The August 2000 bathymetric survey showed a detectable depth difference over the NL-91 and D/S Mound Complex relative to September 1997. Accumulations of sediment up to 0.5 m thick were attributed to the placement of supplemental CDM at several recommended capping points. The recently-placed, supplemental CDM also was apparent in the majority of the REMOTSÒ sediment-profile images obtained over the NL-91 and D/S Mound Complex in August 2000. The REMOTSÒ images served to demonstrate that the footprint of the supplemental CDM deposit completely covered the original unacceptably-contaminated dredged material (UDM) deposit. These images also showed that the supplemental CDM had been colonized successfully by a benthic community comprised of both Stage II and Stage III organisms.

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The NL-91 and D/S Mound Complex is a historic sediment deposit on the NLDS seafloor located within the US Navy submarine corridor established near the center of the disposal site. This subtle bottom feature is composed of material dredged and disposed during the 1991 and 1992 disposal season. Several previous REMOTS sediment profile photography surveys have served to demonstrate that the mound complex has been successfully recolonized by benthic organisms since its creation in 1992, while previous bathymetric surveys have indicated a need to increase the thickness of the capping dredged material (CDM) layer over the mound complex. Since the 1996-97 disposal season, over 30,000 m^3 of supplemental CDM has been placed over the NL-91 and D/S Mound Complex as a part of a cap augmentation plan.

The August 2000 bathymetric survey showed a detectable depth difference over the NL-91 and D/S Mound Complex relative to September 1997. Accumulations of sediment up to 0.5 m thick were attributed to the placement of supplemental CDM at several recommended capping points. The recently-placed, supplemental CDM also was apparent in the majority of the REMOTS sediment-profile images obtained over the NL-91 and D/S Mound Complex in August 2000. The REMOTS images served to demonstrate that the footprint of the supplemental CDM deposit completely covered the original unacceptably-contaminated dredged material (UDM) deposit. These images also showed that the supplemental CDM had been colonized successfully by a benthic community comprised of both Stage II and Stage III organisms.

The Seawolf Mound was developed in the northwest quadrant of NLDS during the 1995-96 disposal season by the placement of 877,500 m^3 of dredged sediment emanating from three separate projects in the eastern Long Island Sound region (Seawolf, Venetian Harbor, and Mystic River). Dredging and disposal operations were tightly controlled to create a single capped disposal mound, the U.S. Navy Seawolf Mound, consisting of 306,000 m^3 of UDM and 571,500 m^3 of suitable CDM. In addition to the multiple bathymetric surveys performed over the mound to ensure successful development, comprehensive environmental monitoring surveys were performed over the Seawolf Mound in 1997 and 1998.

The August 2000 bathymetric survey showed no significant changes in the topography of the Seawolf Mound relative to the survey performed in July 1998. REMOTS sediment profile photography showed the Seawolf Mound continued to be populated by a benthic community consisting of advanced successional stage assemblages, with relatively deep apparent aeration of the sediments comprising the surface of the mound.

The USCGA mound is also a historic dredged material disposal mound, developed within the northeast quadrant of NLDS during the 1994-95 disposal season. This mound consists of 124,000 m^3 of sediment sequentially removed from the area surrounding the Eagle Pier at the US Coast Guard Academy on the Thames River. This bottom feature was considered a confined aquatic disposal (CAD) mound, as the project sediments were directed to a disposal point located between the pre-existing NL-TR and NL-RELIC mounds. Based on the findings of the initial survey effort in August 1995, follow-on monitoring was deferred until the August 2000 field effort.

An advanced benthic successional stage (Stage III) was noted at the majority of REMOTS stations sampled over the USCGA mound. As the USCGA material has been recolonized and subject to increased aeration over time, it has become increasingly difficult to distinguish it from ambient sediments.

Overall, the August 2000 REMOTS sediment-profile imaging survey showed healthy benthic conditions at USCGA, as well as the other project mounds (NL-91 and D/S, and Seawolf) and the NLDS reference areas (NLON–REF, NE-REF, and WEST-REF). The RPD values were consistently deep, indicating good oxygen penetration within the surface sediments. In contrast to previous surveys, little physical disturbance was observed, as many images over each mound and reference area displayed intact amphipod mats and a depositional layer of organic matter on top of the sediments. Amphipods appeared to be in a transition from inactive decaying mats to the reestablishment of active juvenile populations. The average OSI values at the three mounds (NL-91 and D/S, +8; Seawolf, +8; and USCGA, +9) were all greater than the average for the reference areas (+7). Both the mound and reference area OSI values are indicative of healthy or undisturbed benthic habitat quality at the time of the August 2000 survey.

1.0 INTRODUCTION

The Thames River, located in southeastern Connecticut, discharges fresh water and sediment from the interior of eastern Connecticut into Long Island Sound. The mile-wide basin of the lower Thames River and New London Harbor is utilized by military, commercial, and recreational vessels seeking protection from the open waters of the Atlantic Ocean and Long Island Sound. Maintenance dredging of New London Harbor and adjacent coastal areas, overseen by the U.S. Army Corps of Engineers, New England District (NAE), is required to insure navigable waterways and adequate dockage for deep draft, fishing and recreational vessels. Most of the material generated from dredging operations in the New London region is transported by barge and deposited at the New London Disposal Site (NLDS) in Long Island Sound.

The New London Disposal Site (NLDS) is an active open water dredged material disposal site located 5.3 km south of Eastern Point in Groton, CT (Figure 1-1). Centered at 41°16.306′ N, 72° 04.571′ W (NAD 83), the 3.42 km^2 NLDS has water depths which range from 14 m over the NL-RELIC Mound to 24 m at the southern disposal site boundary. Two important management boundaries bisect the NLDS: a 300 m submarine transit corridor and the New York-Connecticut state boundary (Figure 1-1). The submarine corridor was established to minimize conflict between disposal buoy positions and submarine traffic to and from the U.S. Navy Base in Groton, CT. The state boundary affects state regulatory authority under the Coastal Zone Management Act (CZMA) and the issuance of state water quality certification for disposal permits (Carey 1998).

Monitoring of the impacts associated with the subaqueous disposal of sediments dredged from harbors, inlets, and bays in the New England region has been overseen by the Disposal Area Monitoring System (DAMOS) Program since its inception in 1977. The goals of the DAMOS Program pertain to detailed investigation and reduction of any adverse physical, chemical, and biological effects on the marine environment associated with dredged material disposal activities. The monitoring sponsored by DAMOS helps to ensure that the effects of sediment deposition over pre-defined areas of seafloor are local and temporary. A flexible, tiered management protocol is applied in the long-term monitoring of sediment disposal at ten open-water dredged material disposal sites along the coast of New England (Germano et al. 1994).

In recent years, management objectives have sought to minimize the lateral spread of dredged material during placement at NLDS by taking advantage of the topography of the site through filling in depressions between historic disposal mounds. This approach has the dual advantage of maximizing site capacity while minimizing volumes of capping dredged material (CDM) required to completely cover and contain an unacceptably-contaminated dredged material (UDM) deposit (Fredette 1994). Additionally, in order to reduce the effects

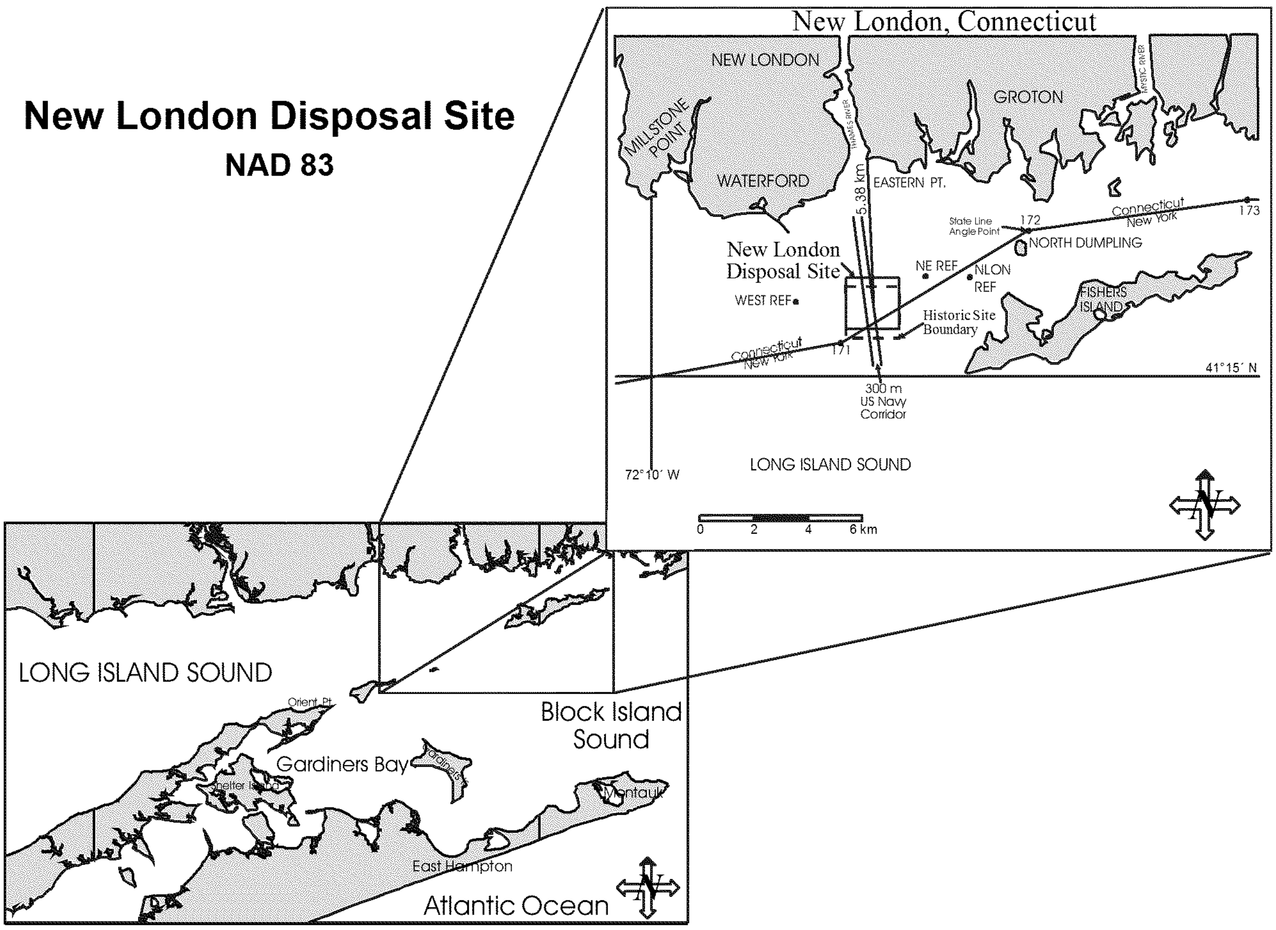

Figure 1-1. Location of the New London Disposal Site

of bottom currents and storm-generated waves, sediment mounds at NLDS are developed in a broad, flat manner, maintaining a minimum water depth of 14 meters. This minimum depth also allows for the safe passage of deep draft Navy and commercial vessels transiting through the disposal site (NUSC 1979). Presently, there are 10 discernible mounds within the boundaries of the disposal site (Figure 1-2).

Follow-up monitoring surveys of three capped mounds (New London 1991 (NL-91) and Dow/Stonington Mound Complex, Seawolf Mound, and USCGA Mound) were conducted at the NLDS in August 2000. All three of these mounds were formed and capped prior to 1997. The development of each mound and recent survey activities are described briefly in the following sections.

1.1 NL-91 and D/S Mound Complex

Disposal activity at NLDS during the 1991–1992 disposal season resulted in the formation of the NL-91 and D/S Mound Complex. Dredging projects in the Mystic and Niantic Rivers, as well as in Stonington Harbor and at the Dow Chemical Company, provided 36,000 m^3 of UDM and 59,300 m^3 of CDM for use in a subaqueous capping project (SAIC 2001a). The sediments were sequentially dredged and placed on the NLDS seafloor in an effort to develop a capped disposal mound.

Depth difference calculations performed as part of the post-cap monitoring effort indicated that cap material thickness over the initial UDM deposit was somewhat less than anticipated. While sediment-profile photographs obtained in 1992 and 1995 indicated a stable and progressing benthic community had rapidly recolonized the capping layer (comprised of fine sand and shell), it was recommended that additional CDM be placed at specific points over the capped mound to further isolate the UDM from the benthic environment (SAIC 2001a).

Nearly 7,000 m^3 of additional CDM was placed over the NL-91 and D/S Mound Complex during the 1997–1998 disposal season and documented in the July 1998 sediment-profile imaging survey. During the 1998-1999 disposal season, a total barge volume of 22,210 m^3 CDM was placed in the northern and central regions of the mound complex (Appendix A). An additional 1,375 m^3 of CDM was deposited over the mound from 16 to 19 May 2000 to continue augmentation of the cap. The topography of the NL-91 and D/S Mound Complex was last surveyed in September 1997 as part of the master bathymetric survey of the entire disposal site.

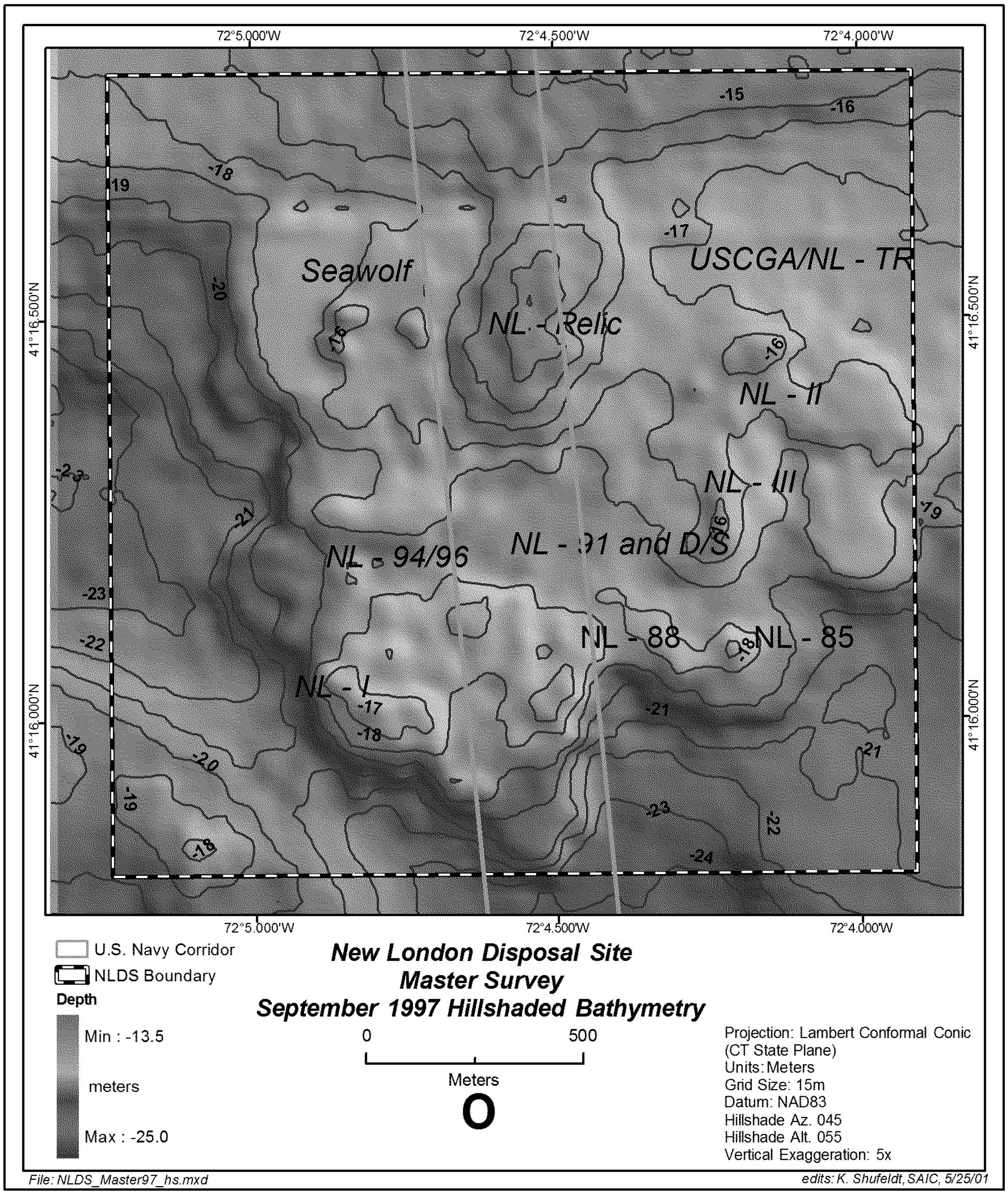

Figure 1-2. Hillshaded bathymetry of New London Disposal Site (contour interval =1.0 m) from the master bathymetry survey conducted in September 1997

1.2 Seawolf Mound

Dredging of the Thames River was deemed necessary when the U.S. Navy decided to homeport the *Seawolf* class submarines in Groton, CT (Maguire Group 1995). The Seawolf dredging project and a small-scale Mystic River project resulted in the placement of 306,000 m^3 of UDM, which was subsequently covered by 556,000 m^3 of CDM in the 1995-1996 season (SAIC 2001b). An additional 15,500 m^3 of sediments from Venetian Harbor and Mystic River deemed suitable for open-water disposal was placed at the NDA95 buoy to the southwest of the main Seawolf Mound. This smaller project also contributed to the Seawolf Mound and was documented in the depth difference calculations between sequential bathymetric survey grids. The Seawolf Mound was last surveyed with REMOTS and bathymetry in July of 1998.

1.3 USCGA Mound

The USCGA Mound was developed during the 1994-95 disposal season as part of a confined aquatic disposal (CAD) project. A total of 124,000 m^3 of dredged material was placed approximately 180 m west of the historic NL-TR mound apex. The USCGA Mound consisted of 43,500 m^3 of UDM subsequently covered by 80,500 m^3 of CDM. The pre-existing NL-TR and NL-II mounds to the east, and the NL-RELIC Mound to the west, served to restrict the lateral spread of the dredged material composing the USCGA Mound. The USCGA Mound was last surveyed with sediment-profile photography and bathymetry in August of 1995 (SAIC 2001a). Based on the findings of the initial environmental monitoring survey (benthic recolonization exceeding expectations), follow-on assessments were deferred until August 2000 to monitor the long-term recovery of the surface sediments.

1.4 Objectives and Predictions

Field operations at NLDS in August 2000 included precision bathymetry and sediment profile photography surveys. Individual bathymetric survey grids were established over the NL-91 and D/S Mound Complex and the Seawolf Mound project areas. Sediment-profile photography surveys were performed over the NL-91 and D/S Mound Complex, the Seawolf Mound, and the USCGA Mound, as well as the NLDS reference areas. These surveys repeated those conducted during previous monitoring cruises to allow detection of possible changes over time.

The objectives of the August 2000 monitoring surveys were to:

- Map the extent of supplemental CDM placed over the NL-91 and D/S Mound Complex project area since September 1997;

- Document and delineate any changes in seafloor topography over the NL-91 and D/S Mound Complex since September 1997 and over the Seawolf Mound since July 1998; and

- Assess the benthic recolonization status of the NL-91 and D/S Mound Complex, the Seawolf Mound, and the USCGA Mound relative to the three reference areas surrounding the NLDS.

The August 2000 field effort tested the following predictions:

- Dependent upon the disposal pattern over the NL-91 and D/S Mound Complex, the deposition of nearly 30,000 m^3 of additional CDM since 1997 will result in accumulations of supplemental cap material on the seafloor having a thickness on the order of 0.5 m.

- The sediments over the NL-91 and D/S Mound Complex, the Seawolf Mound, and the USCGA Mound will be supporting a stable benthic community, with Stage II and Stage III organisms abundant and OSI values comparable to those at the adjacent NLDS reference areas.

2.0 METHODS

2.1 NLDS Survey Areas

Field operations at the New London Disposal Site were conducted aboard the M/V *Beavertail* from 10 to 13 August 2000. An 800 × 800 m bathymetric survey centered on the NL-91 and D/S Mound Complex was completed to document changes in seafloor topography resulting from the recent deposition of supplemental CDM (Figure 2-1). A total of 33 lanes, oriented east-west and spaced 25 m apart, were occupied over the bottom feature. In order to improve the accuracy of depth difference comparisons, the August 2000 survey lanes overlaid segments of the lanes established for the 1997 master survey of the site. A second, independent bathymetric survey was performed over the Seawolf Mound using the same 1000 × 1000 m grid as in previous surveys (1995 through 1998; Figure 2-1). The Seawolf Mound survey consisted of 41 lanes oriented north-south and spaced 25 m apart.

Sediment-profile photography surveys were conducted to map the distribution of dredged material and to evaluate benthic recolonization over the NL-91 and D/S Mound complex, as well as the Seawolf and USCGA disposal mounds, relative to three surrounding reference areas (NE-REF, NLON-REF, and WEST-REF; see Figure 1-1). Three replicate images were obtained at each station to monitor long-term benthic recovery at all three mounds and the distribution of recently-placed CDM at the NL-91 and D/S Mound Complex. Separate sampling grids were established over each project mound (Figure 2-1 and Table 2-1).

2.2 Navigation

During the field operations, a Trimble 4000 RSi Global Positioning System (GPS) receiver interfaced with a Trimble NavBeacon XL differential receiver provided precise navigation data. Because of its proximity to the survey area, the U.S. Coast Guard differential beacon broadcasting from Montauk Point, NY (290 kHz) was used for generating the real-time differential corrections. During all survey operations, the Trimble DGPS system output real-time navigation data in the horizontal control of North American Datum of 1983 (NAD 83; Latitude and Longitude) at a rate of once per second to an accuracy of ±3 m.

Coastal Oceanographic's HYPACK survey and data acquisition software was used to provide real-time interface, display, and logging of the DGPS data. Prior to field operations, HYPACK was used to define a Universal Transverse Mercator (UTM-Zone 18) grid around the survey area, to establish the planned sediment-profile photography stations, and to construct the planned bathymetric survey lanes. During the survey operations, the incoming DGPS navigation data were translated into UTM coordinates, time-tagged, and stored within HYPACK. Depending on the type of field operation being conducted, the real-time navigation information was displayed in a variety of user-defined modes within HYPACK.

Table 2-1
Grain Size Scales for Sediments

ASTM (Unified) Classification[1]	U.S. Std. Sieve[2]	Size in mm	Phi (Φ) Size	Wentworth Classification[3]
Boulder		4096.	-12.0	
		1024.	-10.0	Boulder
	12 in (300 mm)	256.	-8.0	
		128.	-7.0	Large Cobble
Cobble		107.64	-6.75	
		90.51	-6.5	Small Cobble
	3 in (75mm)	76.11	-6.25	
		64.00	-6.0	
		53.82	-5.75	
		45.26	-5.5	
		38.05	-5.25	Very Large Pebble
Coarse Gravel		32.00	-5.0	
		26.91	-4.75	
		22.63	-4.5	
	3/4 in (19 mm)	19.03	-4.25	Large Pebble
		16.00	-4.0	
		13.45	-3.75	
		11.31	-3.5	
		9.51	-3.25	Medium Pebble
Fine Gravel	2.5	8.00	-3.0	
	3	6.73	-2.75	
	3.5	5.66	-2.5	
	4 (4.75 mm)	4.76	-2.25	Small Pebble
	5	4.00	-2.0	
	6	3.36	-1.75	
Coarse Sand	7	2.83	-1.5	
	8	2.38	-1.25	
	10 (2.0 mm)	2.00	-1.0	Granule
	12	1.68	-0.75	
	14	1.41	-0.5	
	16	1.19	-0.25	
	18	1.00	0.0	Very Coarse Sand
Medium Sand	20	0.84	0.25	
	25	0.71	0.5	
	30	0.59	0.75	
	35	0.50	1.0	Coarse Sand
	40 (0.425 mm)	0.420	1.25	
	45	0.354	1.5	
	50	0.297	1.75	
	60	0.250	2.0	Medium Sand
	70	0.210	2.25	
	80	0.177	2.5	
	100	0.149	2.75	
Fine Sand	120	0.125	3.0	
	140	0.105	3.25	Fine Sand
	170	0.088	3.5	
	200 (0.075 mm)	0.074	3.75	
	230	0.0625	4.0	
	270	0.0526	4.25	Very Fine Sand
	325	0.0442	4.5	
Fine-grained Soil:	400	0.0372	4.75	
		0.0312	5.0	
Clay if PI ³ 4 and plot of PI vs. LL		0.0156	6.0	Coarse Silt
is on or above "A" line*		0.0078	7.0	
Silt if PI < 4 and plot of PI vs.		0.0039	8.0	
LL is below "A" line*		0.00195	9.0	
		0.00098	10.0	Medium Silt
* and the presence of organic matter		0.00049	11.0	Fine Silt
does not influence LL.		0.00024	12.0	Very Fine Silt
		0.00012	13.0	Coarse Clay
		0.000061	14.0	Medium Clay
				Fine Clay

1. ASTM Standard D 2487-92. This is the ASTM version of the Unified Soil Classification System. Both systems are similar (from ASTM (1993)).
2. Note that British Standard, French, and German DIN mesh sizes and classifications are different. 3. Wentworth sizes (in inches) cited in Krumbein and Sloss (1963).

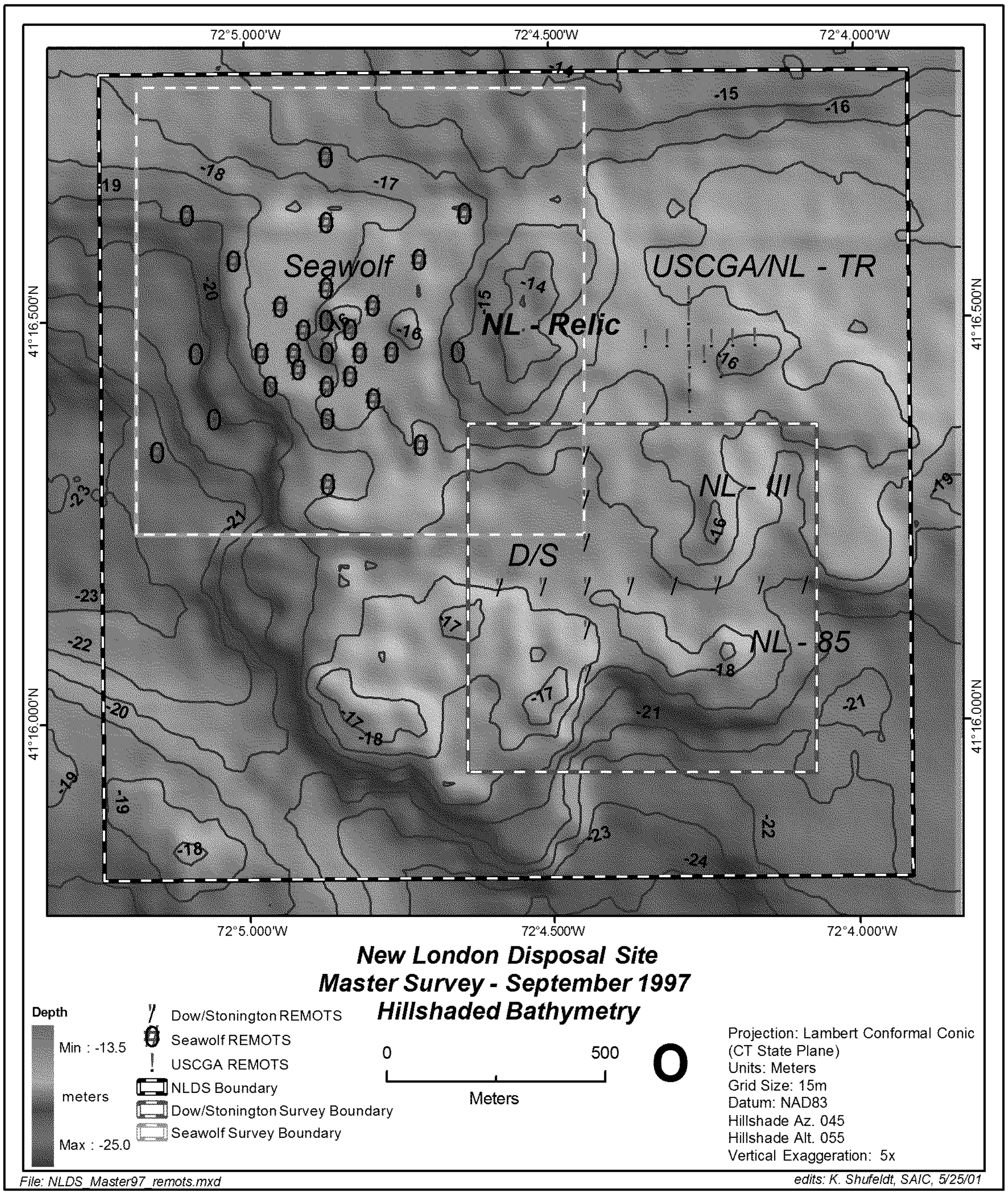

Figure 2-1. August 2000 REMOTS® stations and bathymetric survey areas over the 1997 master bathymetric survey

2.3 Bathymetric Data Acquisition and Analysis

2.3.1 Bathymetric Data Acquisition

During the bathymetric survey, HYPACK® was interfaced with an Odom Hydrotrac® survey echosounder, as well as the Trimble DGPS system. The Hydrotrac® uses a narrow-beam (3°), 208-kHz transducer to make discrete depth measurements and produce a continuous digital data output and an analog record of the seafloor. The Hydrotrac® transmits approximately 10 digital depth values per second (depending on water depth) to the data acquisition system. Within HYPACK®, the time-tagged position and depth data were merged to create continuous depth records along the actual survey track. These records could be viewed in near real-time to ensure adequate coverage of the survey area and verify data quality.

2.3.2 Bathymetric Data Processing

The bathymetric data were fully edited and processed using HYPACK®'s data processing modules. Raw position and sounding data were edited as necessary to remove or correct questionable data. Sound velocity and draft corrections also were applied. In addition, the sounding data set was reduced to the vertical datum of Mean Lower Low Water (MLLW) using observed tides obtained from the National Oceanic and Atmospheric Administration (NOAA).

During bathymetric survey data acquisition, an assumed and constant water column sound velocity was entered into the Odom echosounder. In order to account for the variable speed of sound through the water column, a Seabird Instruments, Inc. SEACAT SBE 19-01 Conductivity, Temperature, and Depth (CTD) probe was used to obtain sound velocity profiles at the start, midpoint, and end of each field survey day. An average sound velocity was calculated for each day from the water column profile data, and then entered into a HYPACK® sound velocity correction table. Using the assumed sound velocity entered into the echosounder and the computed sound velocity from the CTD casts, HYPACK® then computed and applied the required sound velocity corrections to all of the sounding records.

Observed tide data were obtained through NOAA's National Water Level Observation Network. The NOAA six-minute tide data were downloaded in the MLLW datum and corrected for tidal offsets. SAIC used the water level data available from the operating NOAA tide station in New London, CT (Station 8461490).

After the bathymetric data were fully edited and referenced to MLLW, cross-check comparisons on overlapping data were performed to verify the proper application of the correctors and to evaluate the consistency of the data set. After the full data set was verified, it was run through the HYPACK Sort routine to reduce its size. Because of the rapid rate at which a survey echosounder can generate data (approximately ten depths per second), the along-track data density for a single-beam survey tends to be very high (multiple soundings per meter). In most cases, these data sets contain many redundant data points that can be eliminated without any effect on overall data quality. The Sort routine examines the data along each survey line and then extracts only the representative soundings based on a user-specified distance interval or search radius. The output from the Sort routine is a merged ASCII-XYZ (horizontal position and corrected depth) file that may contain anywhere from 2-10% of the original data set. These greatly reduced, but still representative, data sets are far more efficient to use in the subsequent modeling and analysis routines. For the NLDS survey, the data were sorted at distance intervals of 5 and 10 m for later analysis.

2.3.3 Bathymetric Data Analysis

The goal of the data analysis was to create seafloor surface models from the fully processed bathymetric data, and then to evaluate these models in an attempt to identify any unique topographic features and account for any observed differences between consecutive surveys. For the NLDS survey, the analysis technique used to evaluate the 2000 survey and compare it with the most recent 1997 survey has been used routinely during past DAMOS Program monitoring surveys. This technique entails calculating and then mapping the difference in depth between similarly gridded data sets for the two surveys. With this technique, the sorted ASCII-XYZ files were imported into ESRI's ArcView software, and a grid system was defined over the NLDS survey areas. Because the survey track-lines were spaced at 25 m intervals, a cell-size of 12.5 m (along- track) by 25 m (cross-track) was specified to ensure sufficient data coverage to fill each cell. An ArcView gridding routine was then run to average all of the single-beam data points that fell within each cell and generate a single depth value that was assigned to the center of each cell. The end result of this process was a matrix of depth values that defined a three dimensional surface model of the survey area. A similar grid-filling process was performed over both the NL-91 and D/S Mound Complex and the Seawolf Mound survey areas using both the 2000 and 1997 data sets. The two grids for both areas were then depth differenced in an attempt to highlight areas of significant change between the two surveys.

2.4 REMOTS Sediment-Profile Photography

Remote Ecological Monitoring of the Seafloor (REMOTS) is a benthic sampling technique used to detect and map the distribution of thin (<20 cm) dredged material layers, map benthic disturbance gradients, and monitor the process of benthic recolonization over the disposal mound. This is a reconnaissance survey technique used for rapid collection, interpretation and mapping of data on physical and biological seafloor characteristics. The DAMOS Program has used this technique for routine disposal site monitoring for over 20 years. The REMOTS® hardware consists of a Benthos Model 3731 Sediment-Profile Camera designed to obtain undisturbed, vertical cross-section photographs (*in situ* profiles) of the upper 15 to 20 cm of the seafloor (Figure 2-2). Computer-aided analysis of each REMOTS® image yields a suite of standard measured parameters, including sediment grain size major mode, camera prism penetration depth (an indirect measure of sediment bearing capacity/density), small-scale surface boundary roughness, depth of the apparent redox potential discontinuity (RPD, a measure of sediment aeration), infaunal successional stage, and Organism-Sediment Index (a summary parameter reflecting overall benthic habitat quality). The REMOTS® determination of sediment grain size major mode is expressed in phi units; Table 2-1 is provided to facilitate conversions between these units and other commonly employed grain size scales. REMOTS® image acquisition and analysis methods are described fully in Rhoads and Germano (1982; 1986) and in the recent DAMOS Contribution 128 (SAIC 2001) and therefore not repeated herein.

A series of REMOTS® sampling grids were established over NLDS in August 2000 to obtain information related to the physical and biological composition of the benthos over the three project mounds. The sampling grid established over the NL-91 and D/S Mound Complex consisted of 13 stations in a cross-shaped pattern, replicating the surveys performed in 1995, 1997, and 1998. The survey was centered at 41° 16.168′ N, 072° 04.439′ W, with one station at the center (station CTR), three stations extending to the north of center (100N, 200N, 300N), five stations to the east (100E through 500E), two stations to the south (100S and 200S), and two stations to the west (100W and 200W: Table 2-2 and Figure 2-1). Along with evaluating benthic habitat conditions over the mound complex, the sediment-profile photographs were used to map the distribution and thickness of new dredged material layers.

The REMOTS® survey performed over the Seawolf Mound in August 2000 was part of a long-term monitoring effort to examine benthic recolonization following the completion of the capping operation in 1996. The station grid employed during both the 1997 and 1998 survey efforts was reoccupied in August 2000 to facilitate time-series comparisons among data sets. The grid consisted of an eight arm radial pattern of 29 stations, spaced 75 m, 150 m, and 300 m from the center, as well as stations 450 m from the center at the NE, N, NW and WSW arms, and one station at the center (41°16.456’N, 72°04.863’W; Table 2-2; Figure 2-1).

The USCGA mound was also sampled as part of a long-term monitoring initiative to verify that this disposal mound had fully recovered five years post disposal. A modified 13-station cross-grid, established over the USCGA mound in September 1995 and centered at 41° 16.474′ N, 072° 04.268′ W, was re-occupied. Two stations were occupied along each of the western, northern, and southeastern arms of the survey grid, with three stations sampled along the eastern and southern arms (Table 2-2; Figure 2-1).

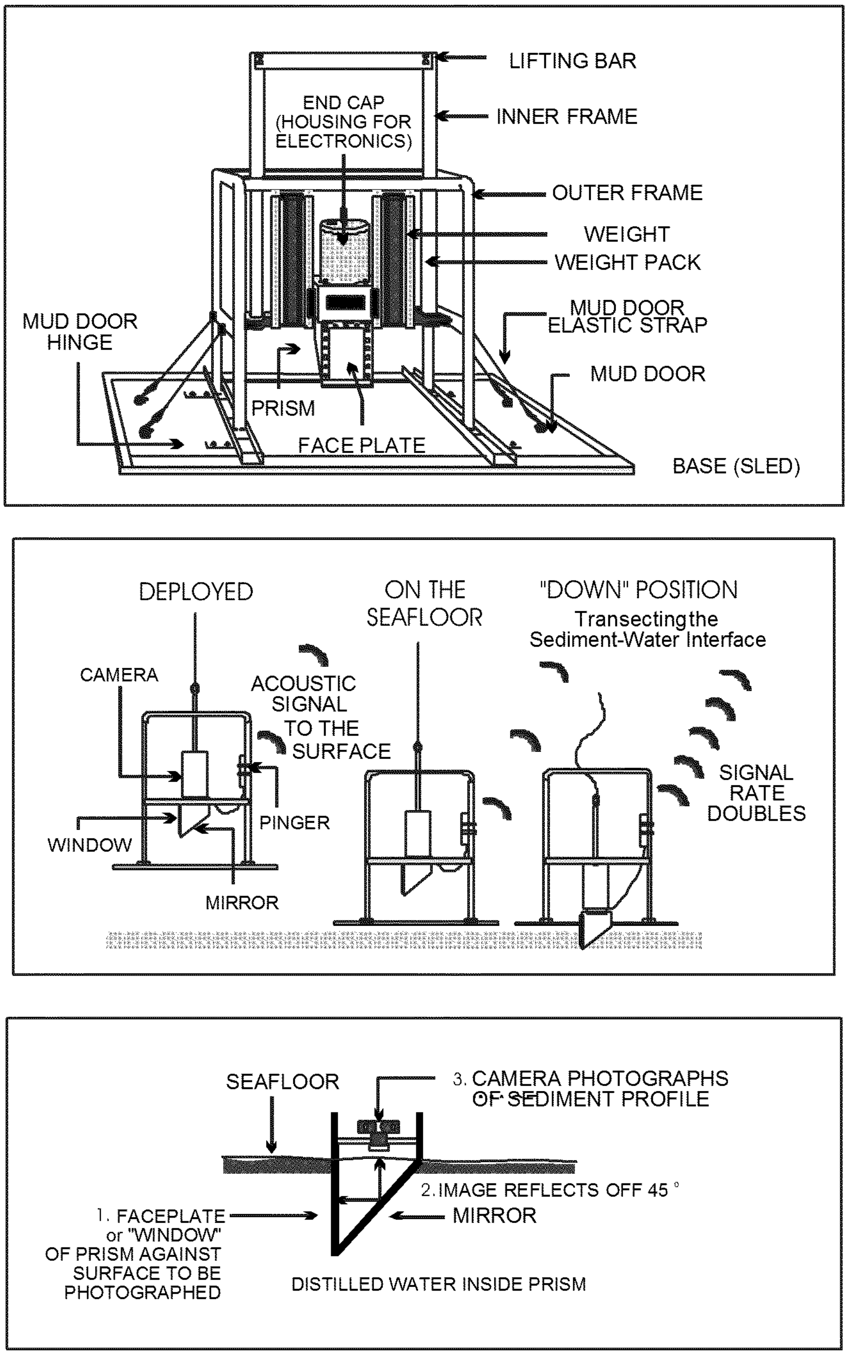

Figure 2-2. Schematic diagram of Benthos, Inc. Model 3731 REMOTS® sediment-profile camera and sequence of operation on deployment.

Table 2-2
New London Disposal Site
August 2000 Target REMOTS® Stations (NAD 83)

Area	Station	Latitude	Longitude
Seawolf Mound 41° 16.456′ N 72° 04.863′ W	CTR	41° 16.456′ N	72° 04.863′ W
	75N	41° 16.496′ N	72° 04.863′ W
	150N	41° 16.537′ N	72° 04.863′ W
	300N	41° 16.618′ N	72° 04.863′ W
	450N	41° 16.699′ N	72° 04.863′ W
	75NE	41° 16.485′ N	72° 04.824′ W
	150NE	41° 16.514′ N	72° 04.787′ W
	300NE	41° 16.571′ N	72° 04.711′ W
	450NE	41° 16.627′ N	72° 04.636′ W
	75E	41° 16.456′ N	72° 04.809′ W
	150E	41° 16.456′ N	72° 04.756′ W
	300E	41° 16.456′ N	72° 04.648′ W
	75SE	41° 16.427′ N	72° 04.825′ W
	150SE	41° 16.399′ N	72° 04.787′ W
	300SE	41° 16.342′ N	72° 04.711′ W
	75S	41° 16.415′ N	72° 04.863′ W
	150S	41° 16.375′ N	72° 04.863′ W
	300S	41° 16.294′ N	72° 04.863′ W
	75WSW	41° 16.436′ N	72° 04.910′ W
	150WSW	41′ 16.415′ N	72° 04.956′ W
	300WSW	41° 16.375′ N	72° 05.049′ W
	450WSW	41° 16.334′ N	72° 05.142′ W
	75W	41° 16.456′ N	72° 04.917′ W
	150W	41° 16.456′ N	72° 04.970′ W
	300W	41° 16.456′ N	72° 05.078′ W
	75NW	41° 16.485′ N	72° 04.901′ W
	150NW	41° 16.514′ N	72° 04.939′ W
	300NW	41° 16.571′ N	72° 05.015′ W
	450NW	41° 16.628′ N	72° 05.091′ W
USCGA Mound 41° 16.474′ N 72° 04.268′ W	CTR	41° 16.474′ N	72° 04.268′ W
	50N	41′ 16.501′ N	72° 04.268′ W
	100N	41° 16.528′ N	72° 04.268′ W
	50E	41° 16.474′ N	72° 04.232′ W
	100E	41° 16.474′ N	72° 04.196′ W
	150E	41° 16.474′ N	72° 04.161′ W
	50SE	41° 16.455′ N	72° 04.243′ W
	100SE	41° 16.436′ N	72° 04.217′ W
	50S	41° 16.447′ N	72° 04.268′ W
	50W	41° 16.474′ N	72° 04.304′ W
	100W	41° 16.474′ N	72° 04.340′ W
	150S	41° 16.393′ N	72° 04.268′ W

Area	Station	Latitude	Longitude
D/S Mound 41° 16.168′ N 72° 04.439′ W	CTR	41° 16.168′ N	72° 04.439′ W
	100N	41° 16.222′ N	72° 04.439′ W
	200N	41° 16.276′ N	72° 04.439′ W
	300N	41° 16.330′ N	72° 04.439′ W
	100S	41° 16.114′ N	72° 04.439′ W
	200S	41° 16.060′ N	72° 04.439′ W
	100E	41° 16.168′ N	72° 04.367′ W
	200E	41° 16.168′ N	72° 04.296′ W
	300E	41° 16.168′ N	72° 04.224′ W
	400E	41° 16.168′ N	72° 04.153′ W
	500E	41° 16.168′ N	72° 04.081′ W
	100W	41° 16.168′ N	72° 04.511′ W
	200W	41° 16.168′ N	72° 04.582′ W
NLON Ref 41° 16.666′ N 72° 01.971′ W	NL-1*	41° 16.785′ N	72° 01.921′ W
	NL-2*	41° 16.580′ N	72° 01.938′ W
	NL-3*	41° 16.667′ N	72° 01.923′ W
	NL-4*	41° 16.618′ N	72° 02.020′ W
NE Ref 41° 16.686′ N 72° 03.371′ W	NE-1*	41° 16.669′ N	72° 03.342′ W
	NE-2*	41° 16.668′ N	72° 03.255′ W
	NE-3*	41° 16.834′ N	72° 03.320′ W
	NE-4*	41° 16.709′ N	72° 03.420′ W
West Ref 41° 16.206′ N 72° 05.971′ W	WR-9*	41° 16.221′ N	72° 05.955′ W
	WR-5*	41° 16.249′ N	72° 05.906′ W
	WR-6*	41° 16.341′ N	72° 05.930′ W
	WR-7*	41° 16.134′ N	72° 05.989′ W
	WR-8*	41° 16.210′ N	72° 05.979′ W

* Actual Location of Reference Area Station Replicate A

3.0 RESULTS

3.1 NL-91 and D/S Mound Complex

3.1.1 Bathymetry

The August 2000 bathymetric survey showed an average depth in the surveyed area of 18.3 m, with depths ranging from 22.8 m in the deeper trough along the southern edge of the area to 14.8 m along the edge of the NL-RELIC mound to the northwest (Figure 3-1). The NL-91 and D/S Mound Complex, labeled "D/S" in Figure 3-1, is located in a shallow seafloor depression. As a bottom feature, it is not well defined, having relatively flat topography compared to the surrounding disposal mounds NL-Relic, NL-III and NL-85 (Figure 3-1).

The comparison of the September 1997 and August 2000 bathymetric surveys resulted in the construction of a preliminary depth difference map which showed a significant number of locations scattered evenly throughout the surveyed area with apparent depth differences ranging between –0.5 and +0.75 m. Most of the areas of apparent depth difference were relatively small-scale and consistently aligned with more complex seafloor features (i.e., areas of greater or lesser vertical relief than the surrounding seafloor). In such locations, it is known that minor deviations in depth measurements can become exaggerated when successive bathymetric surveys are compared. Since there was no dredged material placed at these locations, the apparent depth changes were considered to be normal artifacts of the depth differencing procedure.

In the vicinity of the D/S buoy, depths were consistently shallower in the 2000 survey compared to 1997 (Figure 3-2). Specifically, the area located between the former NDA-91-2 and D/S buoy positions in Figure 3-2 is one where the depth differences were consistently positive, ranging between 0.25 and 0.5 m. This suggests a subtle rise in the seafloor within the area of the NL-91 and D/S Mound Complex, consistent with the placement of an estimated barge volume of 30,000 m^3 of supplemental CDM in this area between the September 1997 and August 2000 bathymetric surveys. The estimated 30,000 m^3 of supplemental CDM emanated from several different dredging projects, and there is good spatial correlation between the placement locations at the sea surface (mainly around recommended Capping Points 1 and 2) and the resulting deposit detected on the seafloor through bathymetric depth differencing (Figure 3-3).

3.1.2 REMOTS Sediment-Profile Photography

REMOTS results from the NL-91 and D/S Mound Complex were used to delineate the distribution of the CDM on the seafloor and to evaluate the status of the benthic

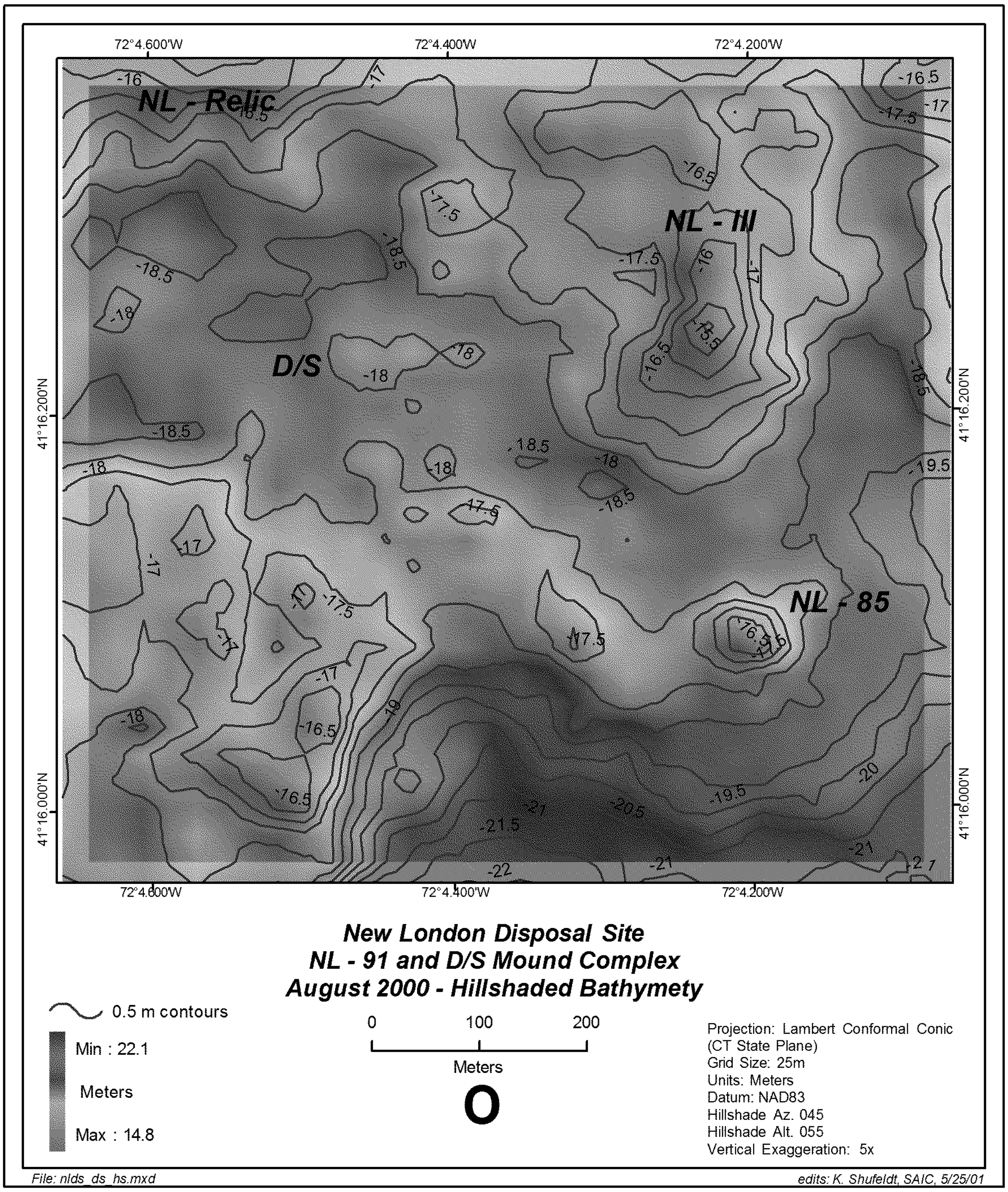

Figure 3-1. Hillshaded bathymetry of the 800 × 800 m NL-91 and D/S Mound Complex survey area, August 2000

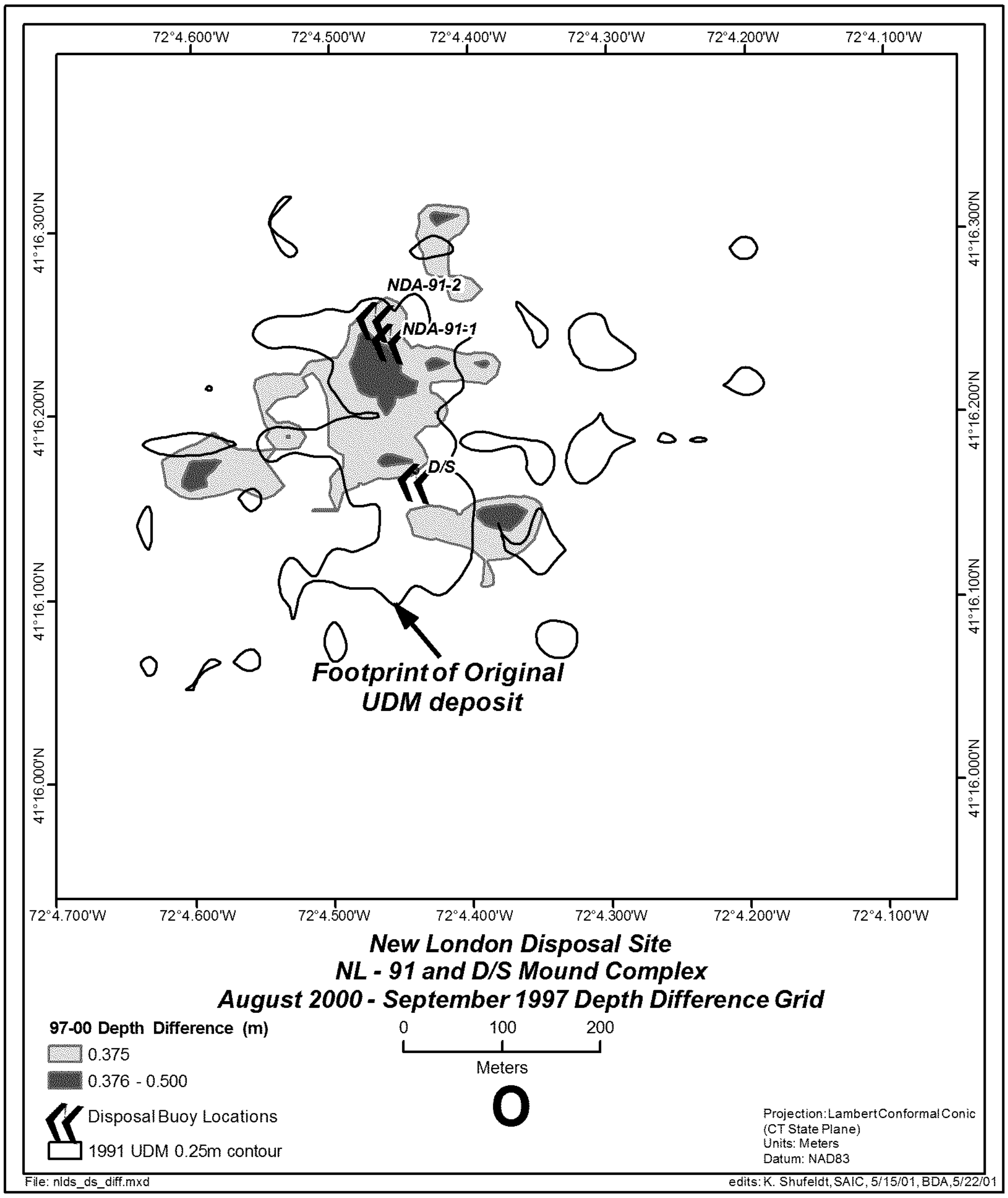

Figure 3-2. Final depth difference results produced from comparisons between the August 2000 and September 1997 bathymetry surveys

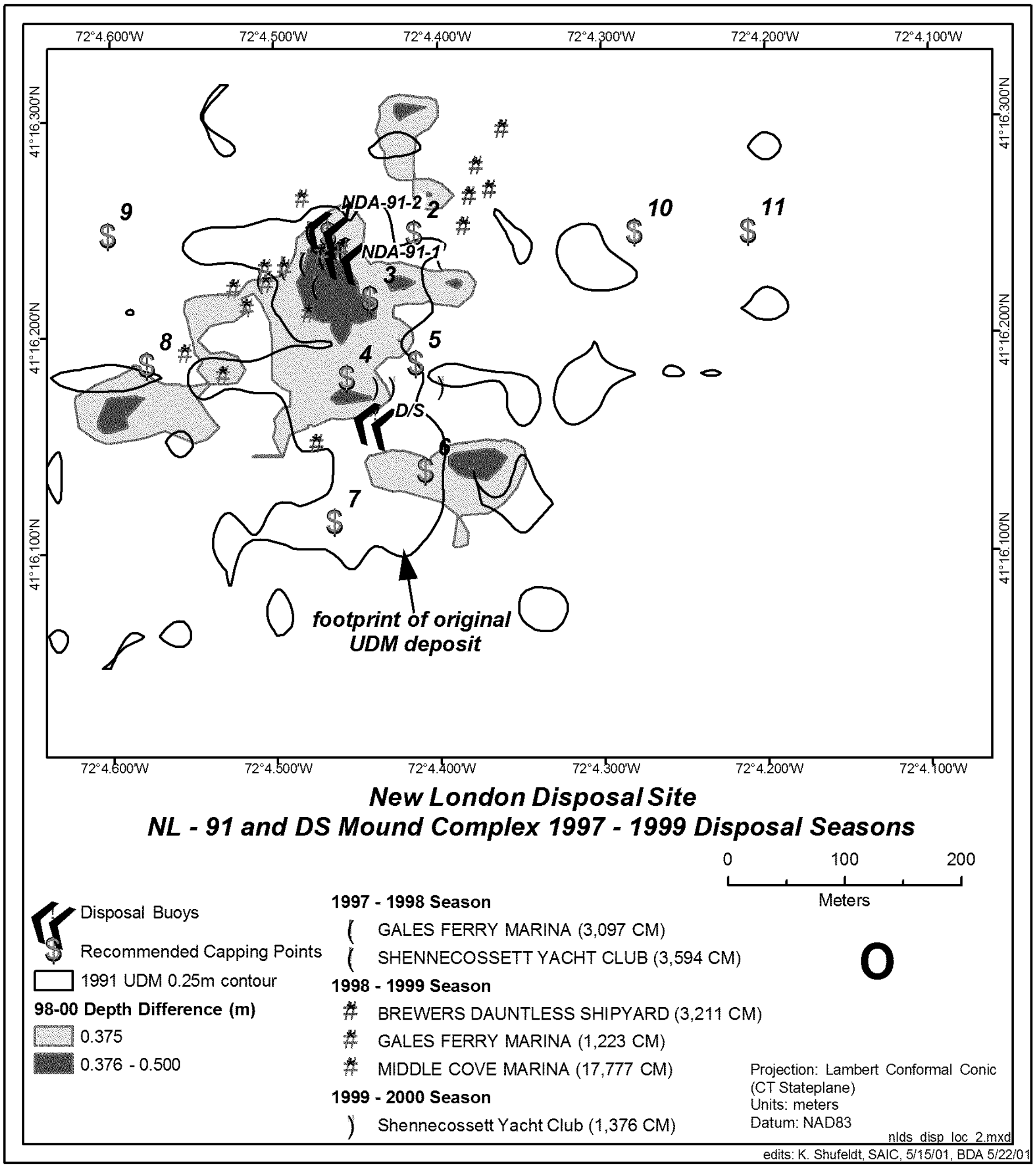

Figure 3-3. Plots of placement locations for Capping Dredged Material (CDM) from several different dredging projects at the NL-91 and D/S Mound Complex, 1997 to 2000. The placement locations are based on coordinates recorded in the Disposal Scow Logs (See Appendix A)

community. Thirteen sampling stations were occupied in August 2000; these are the same stations sampled in three previous REMOTS surveys over this bottom feature. At least three replicate images were obtained and analyzed at each station, except station 300N (only two replicates obtained/analyzed). A complete set of REMOTS image analysis results is provided in Appendix B; these results are summarized in Table 3-1.

The images showed that sediments comprising the surface of the NL-91 and D/S Mound Complex were predominantly silt/clay (grain size major mode of >4 phi). This silt/clay appeared to contain a significant fraction of very fine to fine sand at each station, such that surface sediments across the site are best described as "sandy mud." Sandy mud was also the predominant sediment type at the three reference areas.

All of the sediment observed in the REMOTS images at each of the thirteen stations was identified as capping dredged material. This CDM generally extended from the sediment surface to below the imaging depth of the REMOTS camera prism at each station (see dredged material thickness measurement indicated with a "greater than" sign in Table 3-1). The CDM observed in the images at the majority of stations in August 2000 appeared to be placed recently (i.e., within the past year or two) and was therefore categorized as the newer, supplemental CDM (Figure 3-4 and 3-5A). At stations 200S, 300E, 400E, and 500E, the CDM displayed characteristics similar to those observed in previous surveys (1995, 1997, 1998) and was therefore categorized as "old" CDM (Figure 3-5B). The contour line in Figure 3-4 indicates that the distribution of supplemental CDM as detected in the REMOTS images correlates very well with the bathymetric depth difference results. The deposit of supplemental CDM completely covers the original main deposit of UDM placed at the D/S buoy in 1991.

The apparent RPD measured in each REMOTS image provides an indication of the degree of oxygen penetration into the sediment. A well-developed RPD depth (defined as greater than 3 cm) generally indicates good or healthy sediment aeration as a result of active bioturbation by benthic organisms. The replicate-averaged apparent RPD depths from the mound complex ranged from 1.8 to 4.9 cm, with an overall average of 3.4 cm (Figure 3-6 and Table 3-1). This average value was greater than the average RPD depth of 2.6 cm measured at the reference stations (Table 3-2) and is considered indicative of healthy aeration of the surface sediments.

The successional status was advanced, with Stage II or Stage II on III communities inhabiting the surface sediments of the mound complex (Figure 3-7). Stage III organisms were present at 12 of 13 stations. In addition, tubes of the amphipod *Ampelisca sp.* were observed at the sediment-water interface at 12 of the 13 stations. At numerous stations, the tubes appeared to be mature or in a state of decay (Figure 3-8A). However, patches of

Table 3-1
Summary of REMOTS® Data Collected over the NL-91 and D/S Mound Complex

NL-91 and D/S Station	Number of Replicates Analyzed	Camera Penetration Mean (cm)	Total Dredged Material Thickness Mean (cm)	Recently Placed Dredged Material Thickness (cm)	Number of Replicates w/Dredged Material Present	RPD Mean (cm)	Successional Stages Present	Highest Successional Stage Present	Grain Size Major Mode (phi)	OSI Mean	OSI Median	Boundary Roughness Mean (cm)
CTR	3	15.87	>15.87	>15.87	3	4.92	I, II, III	ST_II_ON_III	>4	8.67	9	1.12
100N	4	13.46	>13.46	10.30	4	3.14	II	ST_II	>4	7.75	8	0.71
100E	3	14.76	>14.76	>14.76	3	3.07	II, III	ST_II_ON_III	>4	8.33	8	0.73
100S	3	11.94	>11.94	>11.94	3	2.70	I, II, III	ST_II_ON_III	>4	8.00	8	0.71
100W	3	10.87	>10.87	>10.87	3	3.75	II, III	ST_II_ON_III	>4	9.33	10	1.15
200N	3	10.78	>10.78	>10.78	3	3.33	I, II, III	ST_II_ON_III	>4	8.00	8	2.71
200E	4	12.25	>12.25	>12.25	4	3.76	I, II, III	ST_II_ON_III	>4	8.25	8	0.70
200S	3	12.17	>12.17	0.00	3	4.34	I, II, III	ST_II_ON_III	>4	9.00	8	1.79
200W	3	12.60	>12.60	>12.60	3	3.62	I, III	ST_I_ON_III	>4	8.67	9	0.80
300N	2	16.79	>16.79	>16.79	2	2.83	II, III	ST_II_ON_III	>4	8.00	8	1.94
300E	3	13.84	>13.84	0.00	3	1.83	I, II, III	ST_I_ON_III	>4	6.00	6	1.62
400E	3	15.23	>15.23	0.00	3	4.65	I, II, III	ST_II_ON_III	>4	9.67	9	1.07
500E	3	14.35	>14.35	0.00	3	2.82	I, II, III	ST_I_ON_III	>4	7.33	8	0.53
AVG	3.08	13.45	>13.45	9.87	3.08	3.44				8.23	8.19	1.20
MAX	4	16.79	>16.79	>16.79	4	4.92				9.67	10	2.71
MIN	2	10.78	10.78	0.00	2	1.83				6.00	6	0.53

Table 3-2
Summary of REMOTS Data Collected at the Reference Area Stations

Reference Station	Number of Replicates Analyzed	Camera Penetration Mean (cm)	RPD Mean (cm)	Successional Stages Present	Highest Successional Stage Present	Grain Size Major Mode (phi)	OSI Mean	OSI Median	Boundary Roughness Mean (cm)
NL-1	6	3.53	2.48	I, II	ST_II	4 to 3	5.17	4.50	1.24
NL-2	3	9.68	1.96	I, II	ST_II	>4	6.00	6	1.24
NL-3	6	7.98	2.80	II, III	ST_II_ON_III	>4	7.83	8	0.95
NL-4	3	8.42	2.41	II	ST_II	>4	7.00	7	0.54
NE-1	3	10.61	1.99	I, II	ST_I_TO_II	>4	4.67	5	0.32
NE-2	3	13.53	3.58	I, II	ST_I_TO_II	>4	7.00	7	0.79
NE-3	3	11.61	2.40	I, III	ST_I_ON_III	>4	7.33	9	0.34
NE-4	3	13.33	2.50	I, II, III	ST_I_ON_III	>4	6.67	6	0.67
WR-1	6	9.84	3.30	II, III	ST_II_ON_III	>4	8.17	8	0.83
WR-2	5	9.46	2.46	II	ST_II	>4	6.80	7	0.81
WR-3	6	10.00	3.16	II, III	ST_II_ON_III	>4	8.00	7.50	1.24
WR-4	6	6.90	2.50	I, II	ST_II	>4	6.50	7	1.32
WR-5	6	11.70	3.06	I, II	ST_II	>4	7.17	8	1.20
AVG	5	9.74	2.66				6.79	6.92	0.88
MAX	6	13.53	3.58				8.17	9	1.32
MIN	3	3.53	1.96				4.67	5	0.32

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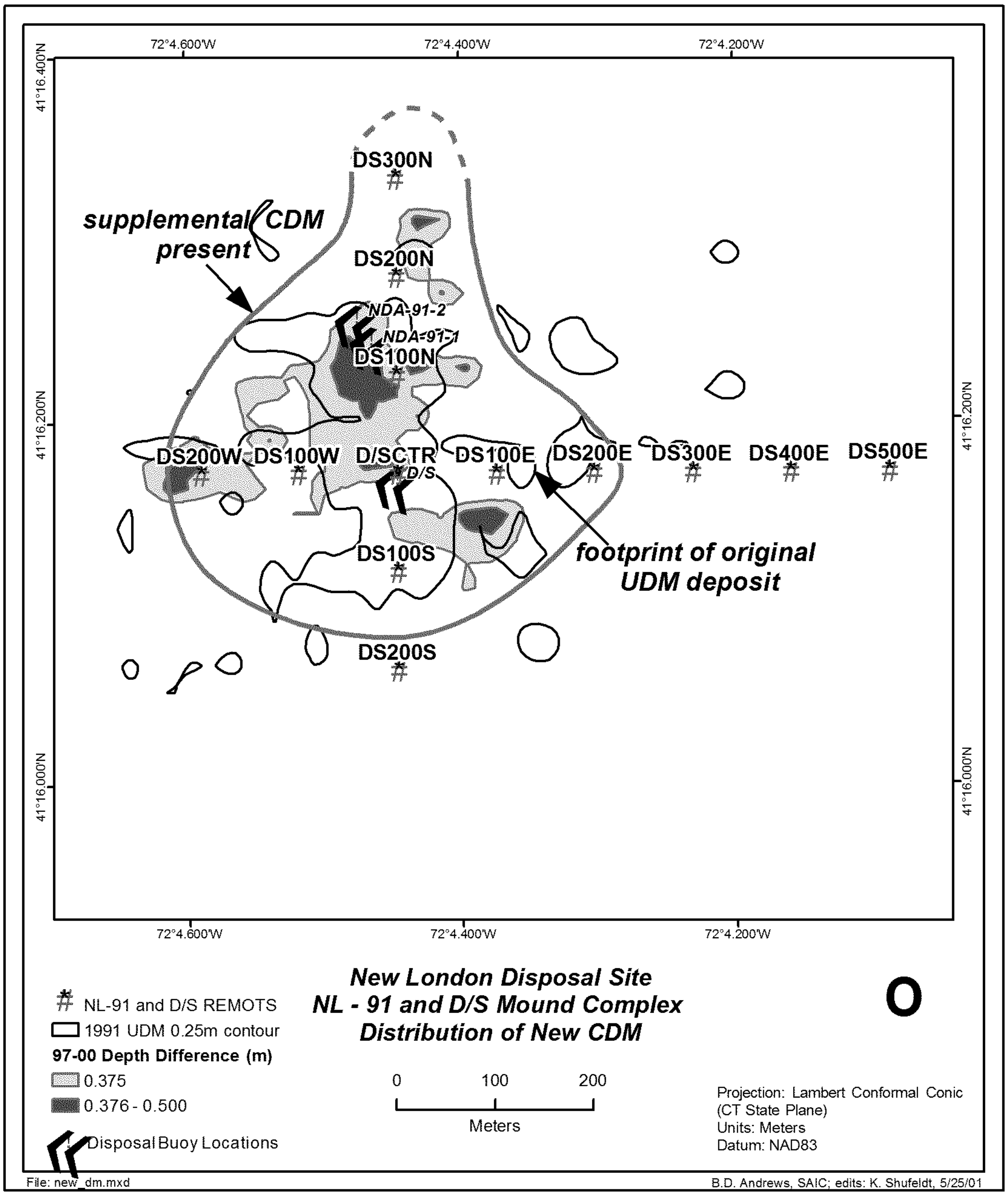


Figure 3-4. Contour line showing the distribution of recently placed supplemental CDM at the NL-91 and D/S Mound Complex as detected in REMOTS□ sediment profile images.

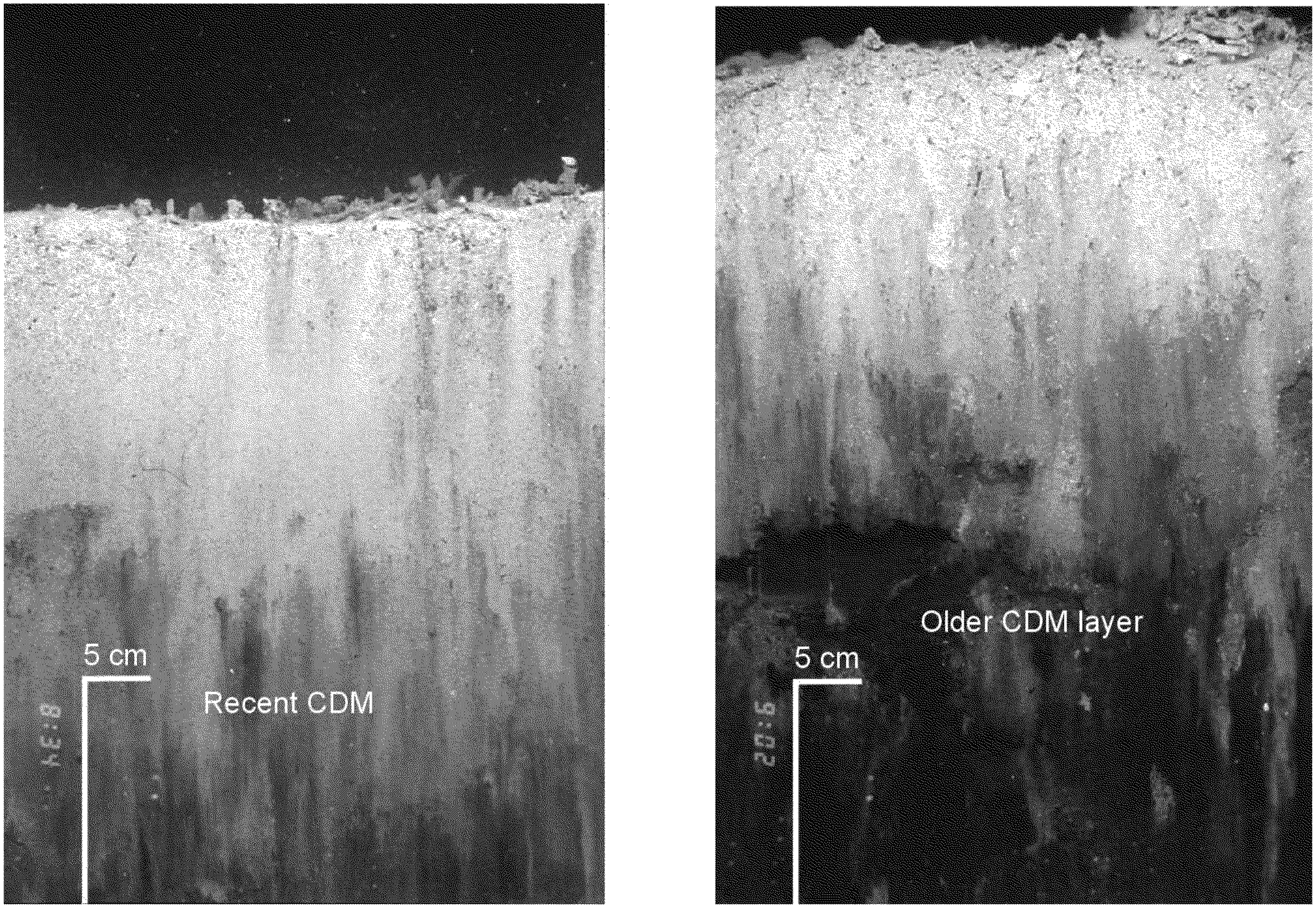


Figure 3-5. REMOTS® images collected over the NL-91 and D/S Mound Complex showing recently deposited supplemental CDM at Station CTR (**A**) versus an older CDM layer deposited at Station 400E during the 1991-92 disposal season (**B**).

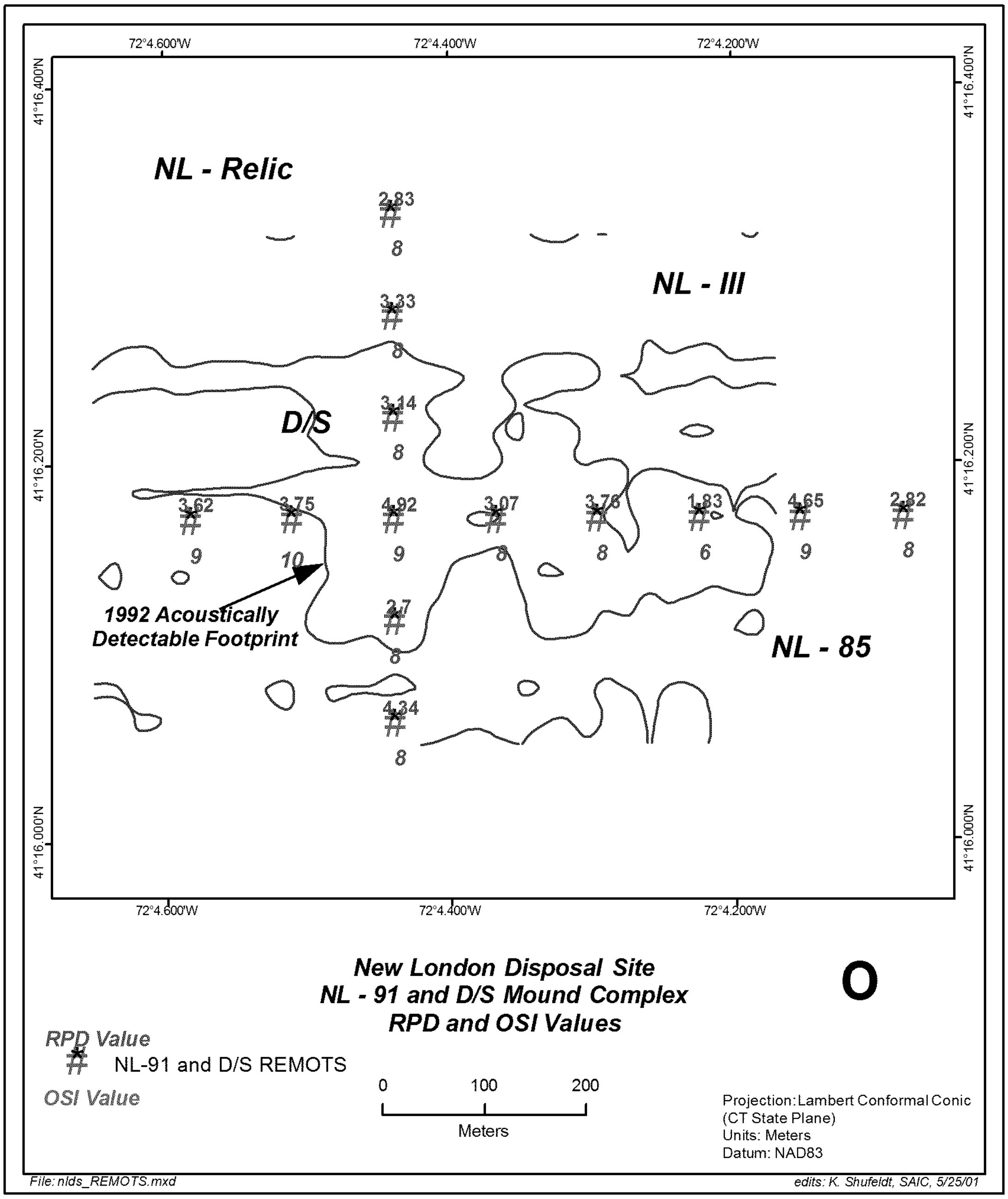


Figure 3-6. Map of replicate-averaged RPD and median OSI values calculated for the REMOTS® stations occupied over the NL-91 and D/S Mound Complex.

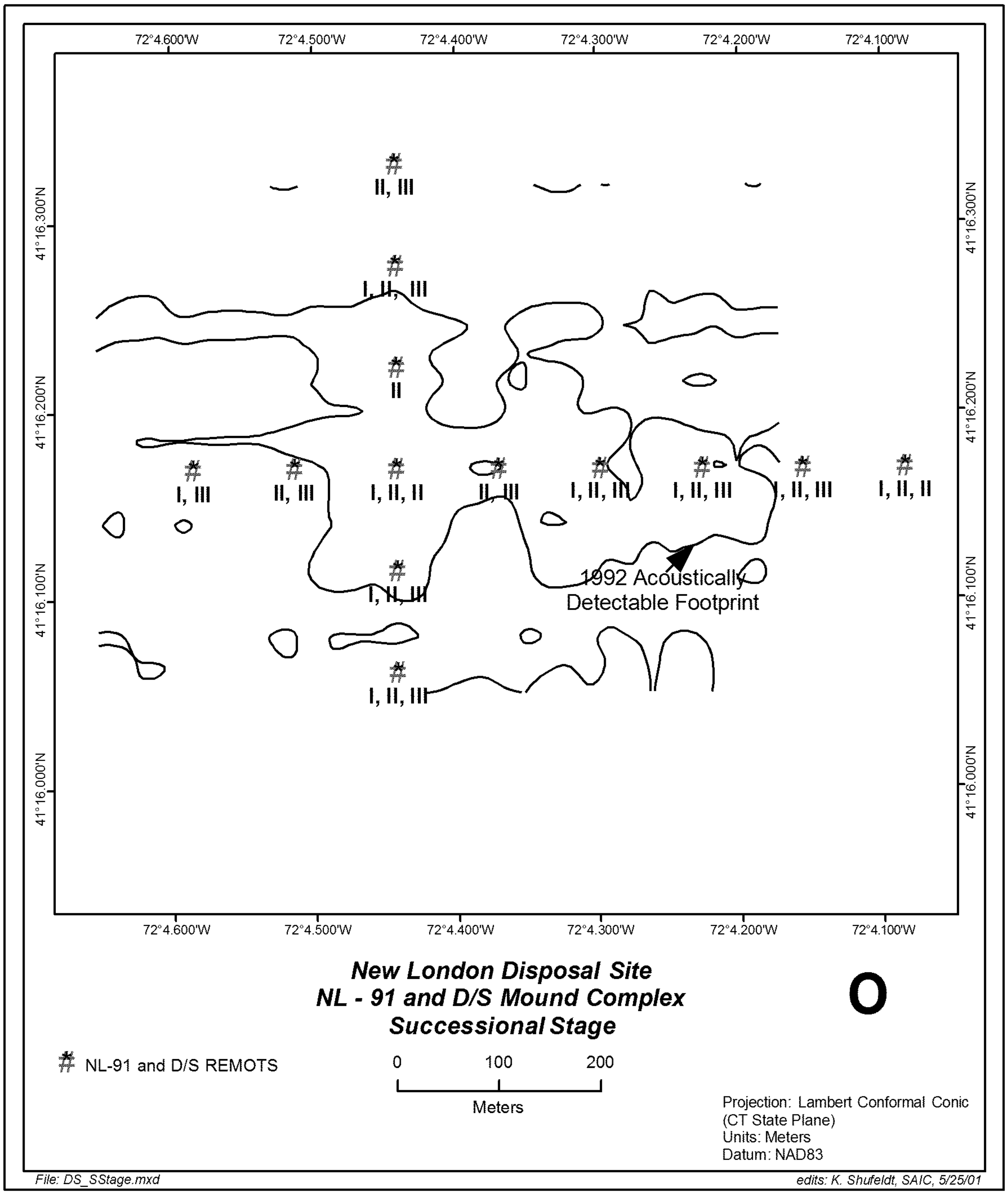


Figure 3-7. Map of succesional stage assembalages detected at the REMOTS® stations occupied over the NL-91 and D/S Mound Complex

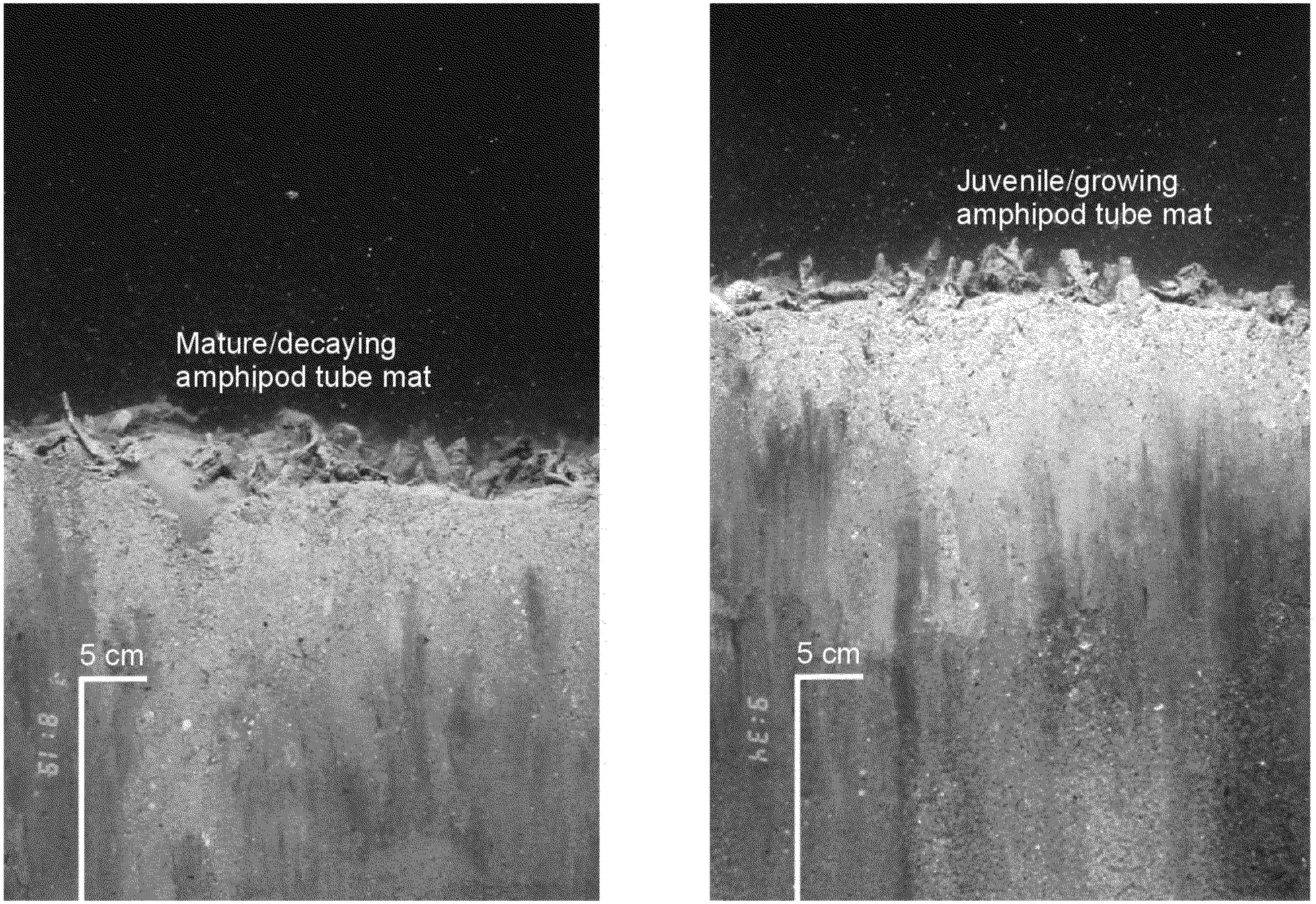


Figure 3-8. REMOTS® photographs collected over Stations 100W (**A**) and 100N (**B**) displaying the difference between mature/decaying amphipod tubes at the sediment-water interface versus a growing juvenile population.

smaller amphipod tubes were noted, indicative of juvenile amphipod population development (Figure 3-8B). Almost all of the images showed a depositional layer of organic detritus present at the sediment surface at the time of the survey (i.e., "organic draping").

Replicate-averaged mean and median OSI values ranged from +6 to +10, with an overall average of +8 (Figure 3-6; Table 3-1). This average is slightly higher than the overall average OSI value of +7 for the reference areas (Table 3-2), suggesting that overall benthic habitat quality over the NL-91 and D/S Mound Complex was comparable to that on the surrounding ambient seafloor at the time of the survey in August 2000.

3.2 Seawolf Disposal Mound

3.2.1 Bathymetry

The August 2000 bathymetric survey of the Seawolf Mound showed depths ranging from 13.4 m over the top of the NL-Relic Mound in the eastern portion of the survey area to 23.0 m in the deeper trough along the southwest corner of the area (Figure 3-9). Water depths over the Seawolf Mound varied from about 15 to 19 m, which was relatively consistent with the most recent survey of 1998. The Seawolf Mound continues to have two small apex regions at depths of 15 to 16 m, and a broad, flat distribution of deposited sediments (Figure 3-9).

The comparison of the August 2000 and July 1998 bathymetric surveys of the Seawolf Mound resulted in the construction of a depth difference map (Figure 3-10). This map shows only a few small, scattered locations where there was an apparent depth change on the order of –0.5 m. These areas generally coincide with the more complex seafloor features, where it is known that minor deviations in depth measurements can become exaggerated when successive bathymetric surveys are compared. Because there has been no dredged material placement activity over the Seawolf Mound area since 1996, the apparent depth changes are considered to be normal artifacts of the depth differencing procedure. The results suggest there have been no significant topographic changes at the Seawolf Mound between the July 1998 and August 2000 bathymetric surveys.

3.2.2 REMOTS® Sediment-Profile Photography

Benthic recolonization of the Seawolf sediments was evaluated using REMOTS® sediment-profile photography. A complete set of REMOTS® image analysis results for the Seawolf Mound is presented in Appendix B. The sediment observed in the REMOTS® images at the majority of the Seawolf Mound stations was classified as dredged material (Figures 3-11 and 3-12A). This material generally extended from the sediment-water

Table 3-3
Summary of REMOTS Data Collected over the Seawolf Disposal Mound

Seawolf Station	Number of Replicates Analyzed	Camera Penetration Mean (cm)	Dredged Material Thickness Mean (cm)	Number of Replicates w/Dredged Material Present	RPD Mean (cm)	Successional Stages Present	Highest Successional Stage Present	Grain Size Major Mode (phi)	OSI Mean	OSI Median	Boundary Roughness Mean (cm)
CTR	3	15.40	>15.40	3	2.44	I, II, III	ST_I_ON_III	>4	6.33	5	1.51
75N	4	11.93	>11.93	4	2.92	II, III	ST_II_ON_III	>4	7.25	7	2.22
75NE	3	14.34	>14.34	3	2.33	II	ST_II	>4	7.00	7	3.39
75E	3	15.88	>15.88	3	4.35	II, III	ST_II_ON_III	>4	9.33	9	0.92
75SE	3	15.43	>15.43	3	2.07	II	ST_II	>4	6.50	7	1.67
75S	3	14.38	>14.38	3	2.64	II, III	ST_II_ON_III	>4	8.33	8	1.77
75WSW	3	16.42	>16.42	3	2.29	II, III	ST_II_ON_III	>4	7.33	6	1.15
75W	4	14.85	>14.85	4	1.76	I, II, III	ST_II_ON_III	>4	5.50	6.5	0.86
75NW	4	16.43	>16.43	4	2.96	II	ST_II	>4	7.25	7.5	1.22
150N	3	15.33	>15.33	3	2.48	II, III	ST_II_ON_III	>4	7.67	7	1.44
150NE	3	15.28	>15.28	3	3.36	II, III	ST_II_ON_III	>4	8.33	9	1.20
150E	4	14.83	>14.83	3	2.49	II	ST_II	>4	7.00	8	1.29
150SE	3	14.54	>14.54	3	2.58	II, III	ST_II_ON_III	>4	7.67	8	1.22
150S	3	13.12	>13.12	3	3.61	I, II, III	ST_II_ON_III	>4	9.33	9	1.29
150WSW	3	16.25	>16.25	3	2.40	II, III	ST_II_ON_III	>4	7.33	7	1.15
150W	3	15.17	>15.17	3	3.48	I, II, III	ST_II_ON_III	>4	8.67	11	2.42
150NW	3	12.07	>12.07	3	2.68	I, II, III	ST_II_ON_III	>4	7.00	8	2.64
300N	3	15.33	>15.33	3	2.86	II	ST_II	>4	7.33	7	0.82
300NE	3	16.37	>16.37	3	4.11	II, III	ST_II_ON_III	>4	9.67	10	1.67
300E	4	10.09	0.00	0	4.17	I, III	ST_III	>4	7.75	7	1.46
300SE	5	11.99	>11.99	3	3.62	I, II, III	ST_II_ON_III	>4	7.80	9	1.28
300S	4	9.33	>9.33	1	4.31	I, II, III	ST_II_ON_III	>4	8.25	7.5	0.71
300WSW	3	14.69	>14.69	3	2.02	II, III	ST_II_ON_III	>4	6.67	6	1.33
300W	5	12.72	>13.25	2	3.57	II, III	ST_II_ON_III	>4	8.20	9	1.65
300NW	4	12.49	>12.49	4	1.87	I, II, III	ST_II_ON_III	>4	6.50	7	3.99
450N	3	12.35	0.00	0	3.54	II, III	ST_II_ON_III	>4	9.33	10	1.16
450NE	3	10.49	0.00	0	3.74	II, III	ST_II_ON_III	>4	8.33	9	0.80
450WSW	3	17.45	>17.45	3	3.40	II, III	ST_II_ON_III	>4	9.00	8	1.24
450NW	3	12.39	>12.39	3	2.99	I, II, III	ST_II_ON_III	>4	8.67	9	1.28
AVG	3	14.05	>12.47	3	3.00				7.77	7.88	1.54
MAX	5	17.45	>17.45	4	4.35				9.67	11	3.99
MIN	3	9.33	0.00	0	1.76				5.50	5	0.71

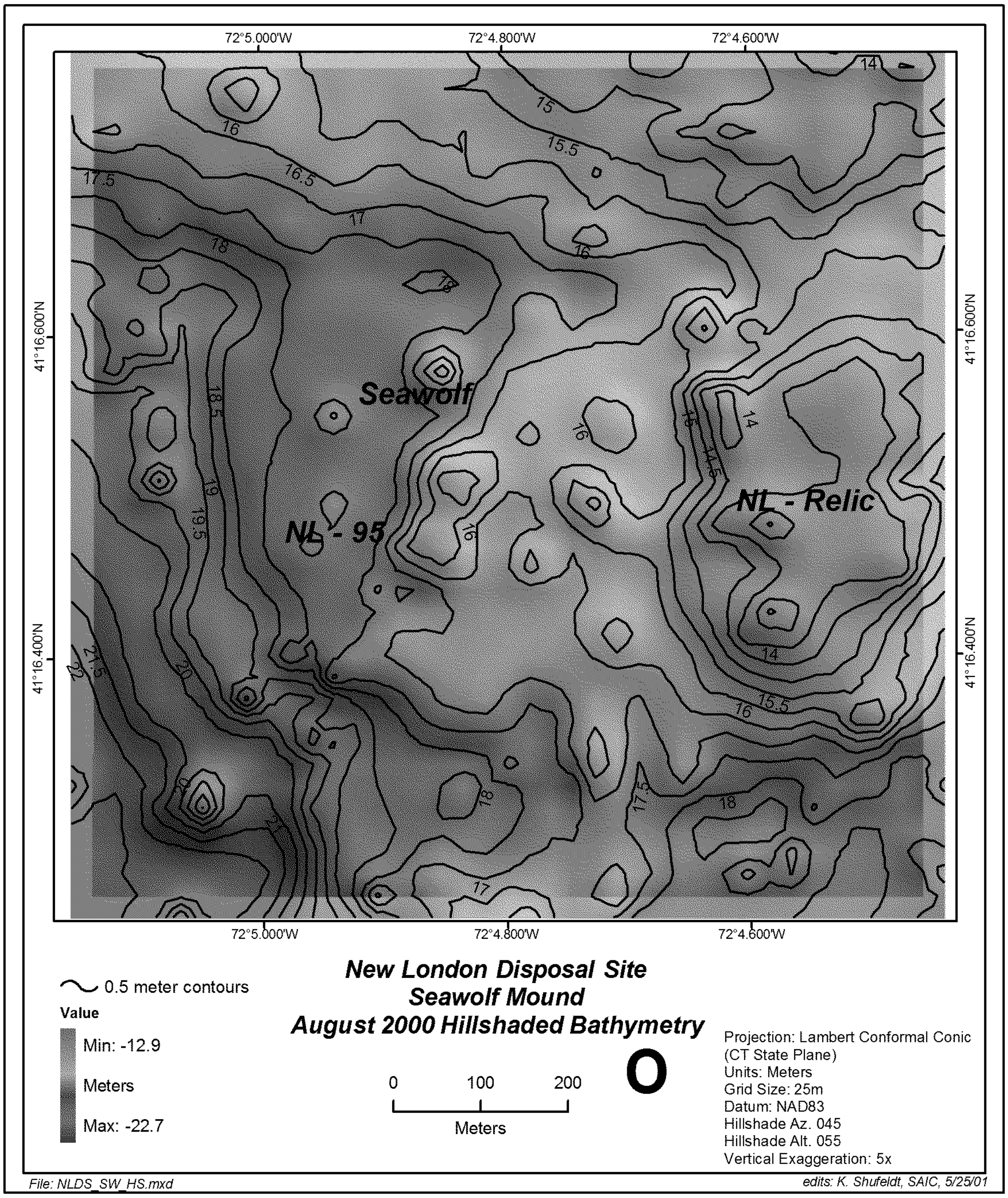


Figure 3-9. Hillshaded bathymetry of the 1000 × 1000 m Seawolf Mound survey area, August 2000

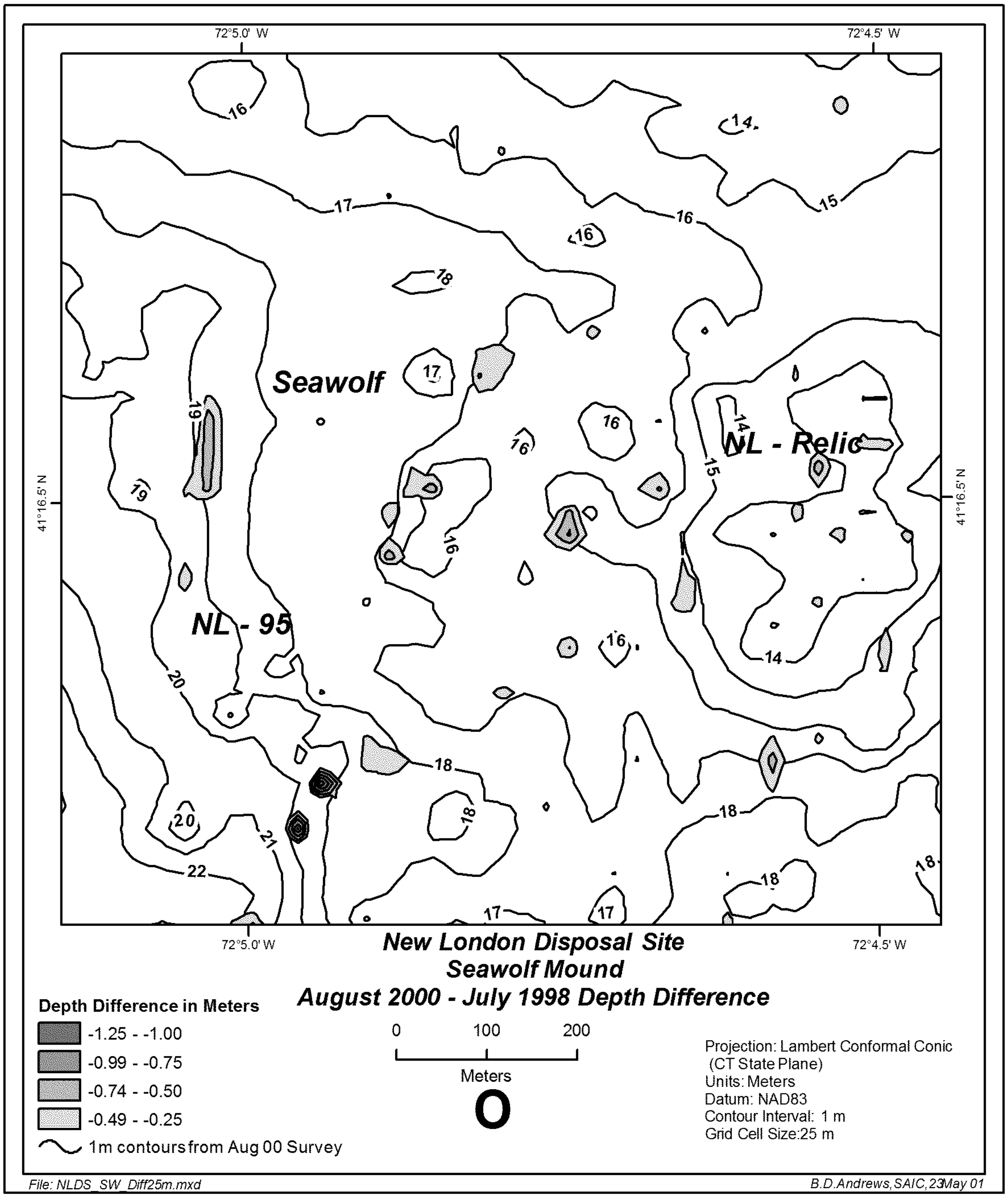


Figure 3-10. Depth difference comparison between the August 2000 and July 1998 1000 × 1000 m bathymetric surveys of the Seawolf Mound

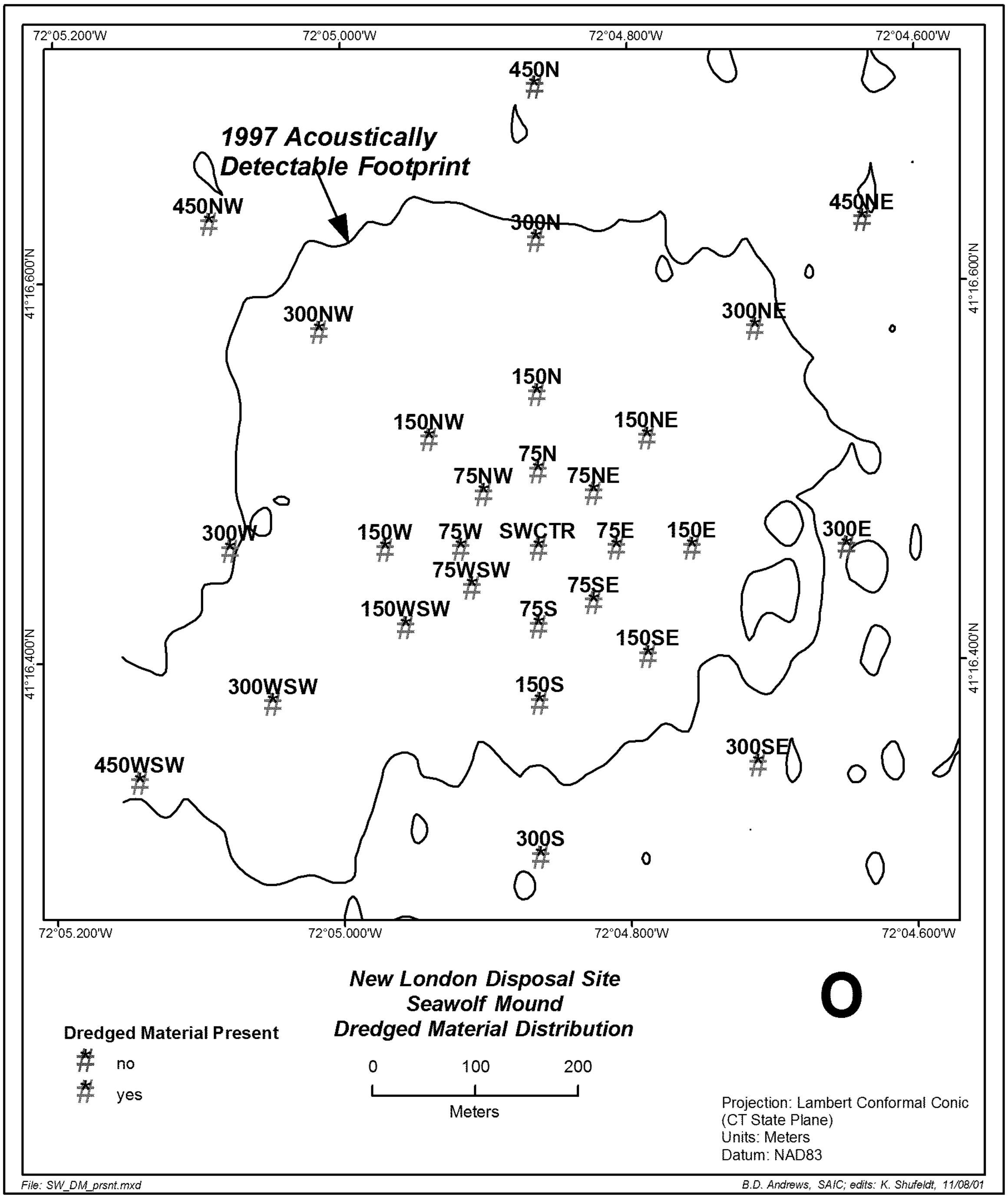


Figure 3-11. Map showing the distribution of dredged material at the Seawolf Mound as detected in the August 2000 REMOTS® survey

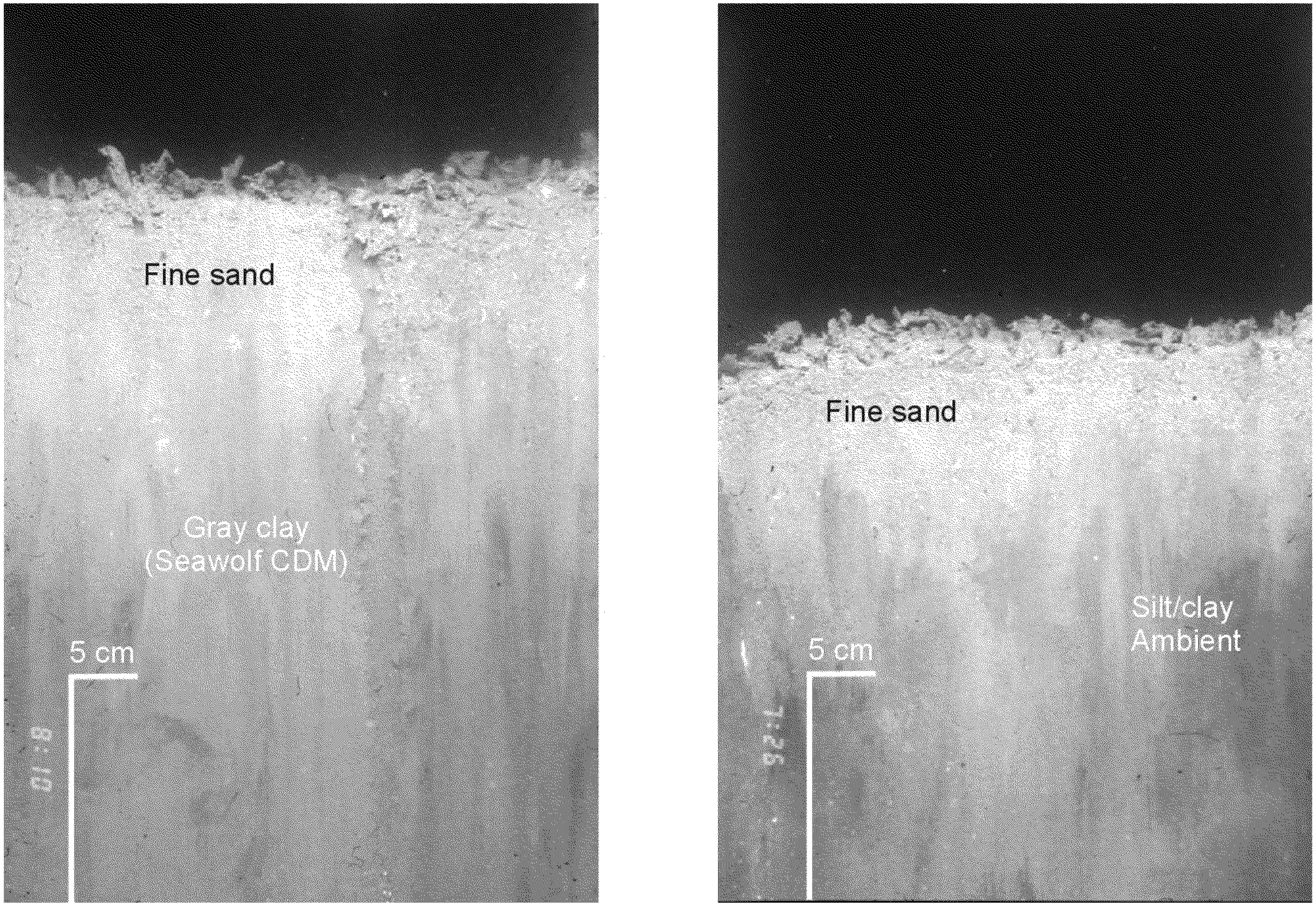


Figure 3-12. REMOTS® sediment-profile photographs collected at Stations 75 WSW (**A**) displaying a thin layer of fine sand over homogeneous gray clay, indicative of Seawolf CDM; and 450N (**B**) displaying ambient sediments (fine sand over silt/clay matrix).

interface to below the imaging depth of the REMOTS camera prism at each station (dredged material thickness measurement indicated with a "greater than" sign in Table 3-3). There was no dredged material observed in the images at stations 300E, 450N and 450NE located on the mound apron (Figures 3-11 and 3-12B). At these stations, the surface sediment appeared to consist of ambient sandy mud.

The Seawolf Mound consisted predominantly of fine-grained silt/clay sediments (grain size major mode of >4 phi) having a significant fine sand component. At most of the stations on the mound, the dredged material comprising the surface sediments was described as a "sandy mud" or "sandy gray clay." The gray clay (Gardiners Clay) is characteristic of this mound and has been observed consistently in previous surveys (SAIC 2001b).

The boundary roughness at the Seawolf Mound ranged from 0.7 to 4.0 cm, with an average of 1.5 cm, which was greater than the average value measured at the reference areas (0.8 cm; Tables 3-2 and 3-3). There was no obvious spatial pattern of boundary roughness values, which were attributed primarily to biological activity (tube construction). Similar to the NL-91 and D/S Mound Complex, a depositional layer of organic detritus was observed on the sediment surface at almost all of the stations.

Lag deposits of shells or pebbles were noted at the sediment-water interface at several stations over the Seawolf Mound (Figure 3-13 A and B). These lag deposits are the result of minor winnowing of fine-grained sediments and serve to armor the surface of the disposal mound. By blocking the winnowing effects of near bottom water currents, these armoring deposits actually prevent mobilization of the underlying fine-grained material and stabilize the surface of the disposal mound.

The replicate-averaged apparent RPD depth for each station ranged from 1.76 to 4.35 cm (Figure 3-14; Table 3-3). The overall average for the Seawolf stations was 3 cm, which was greater than the average RPD (2.66 cm) at the reference areas, suggesting healthy aeration of the sediment surface on the Seawolf mound. There was no evidence of low dissolved oxygen (DO) conditions or redox rebounds observed in the Seawolf mound sediment profile images.

The successional status was advanced, with Stage II or Stage II on III communities inhabiting the sediments of the Seawolf Mound (Figure 3-15). Stage III organisms were present at 23 of 29 stations. Large tubes of the polychaete *Chaetopterus* sp. were visible in several of the replicate images, providing further evidence of advanced recolonization over the Seawolf Mound dredged material (Figure 3-16A). Comparable with the NL-91 and D/S Mound Complex, a significant proportion of the images showed dense tube mats of the amphipod *Ampelisca* sp. Some of these tube mats appeared to be in a state of decay, but active mats comprised of both adults and juveniles were widespread (Figure 3-16B).

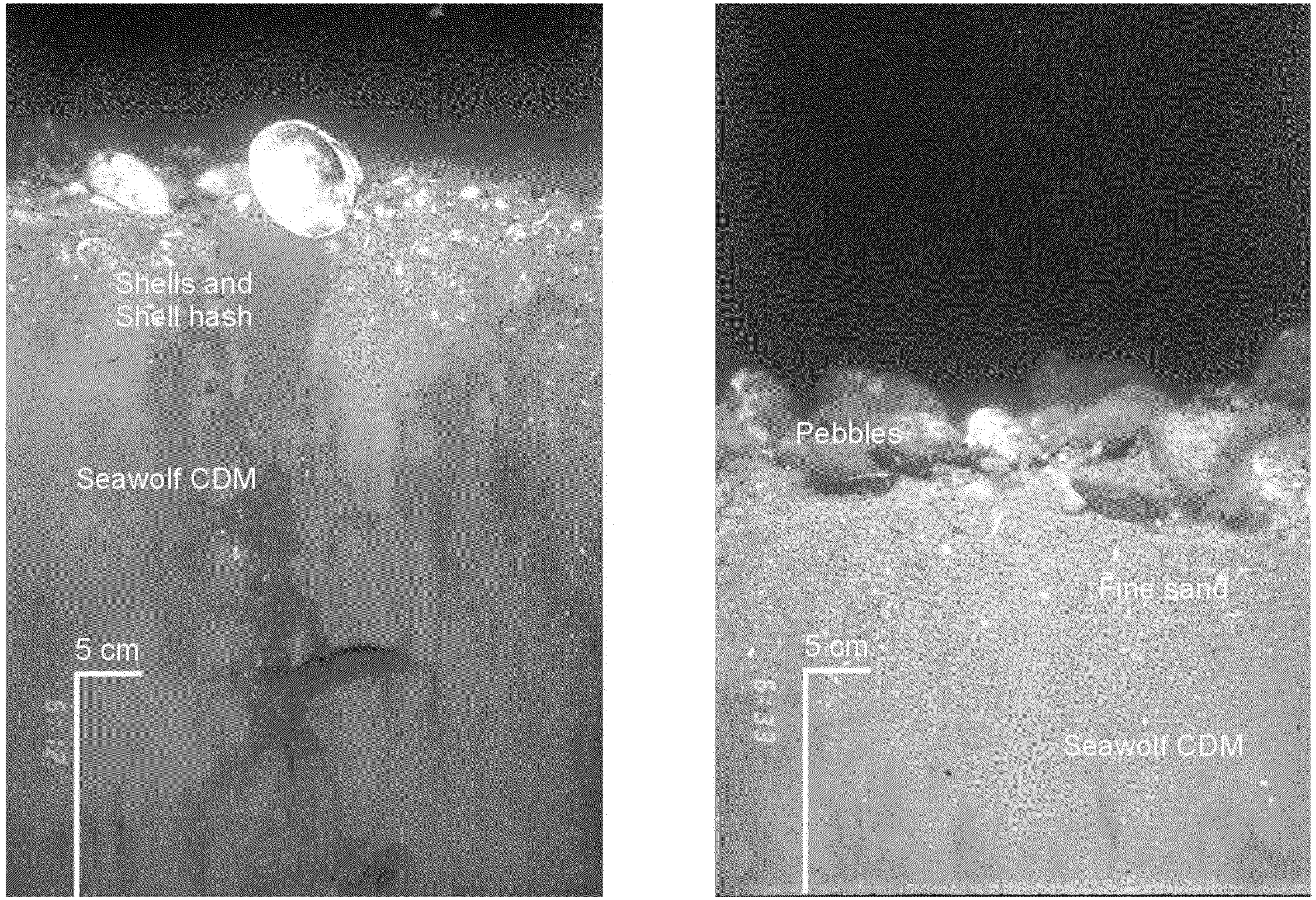


Figure 3-13. REMOTS® sediment-profile photographs displaying armoring deposits of shell (**A**) and pebbles (**B**) at Seawolf Stations CTR and 300SE.

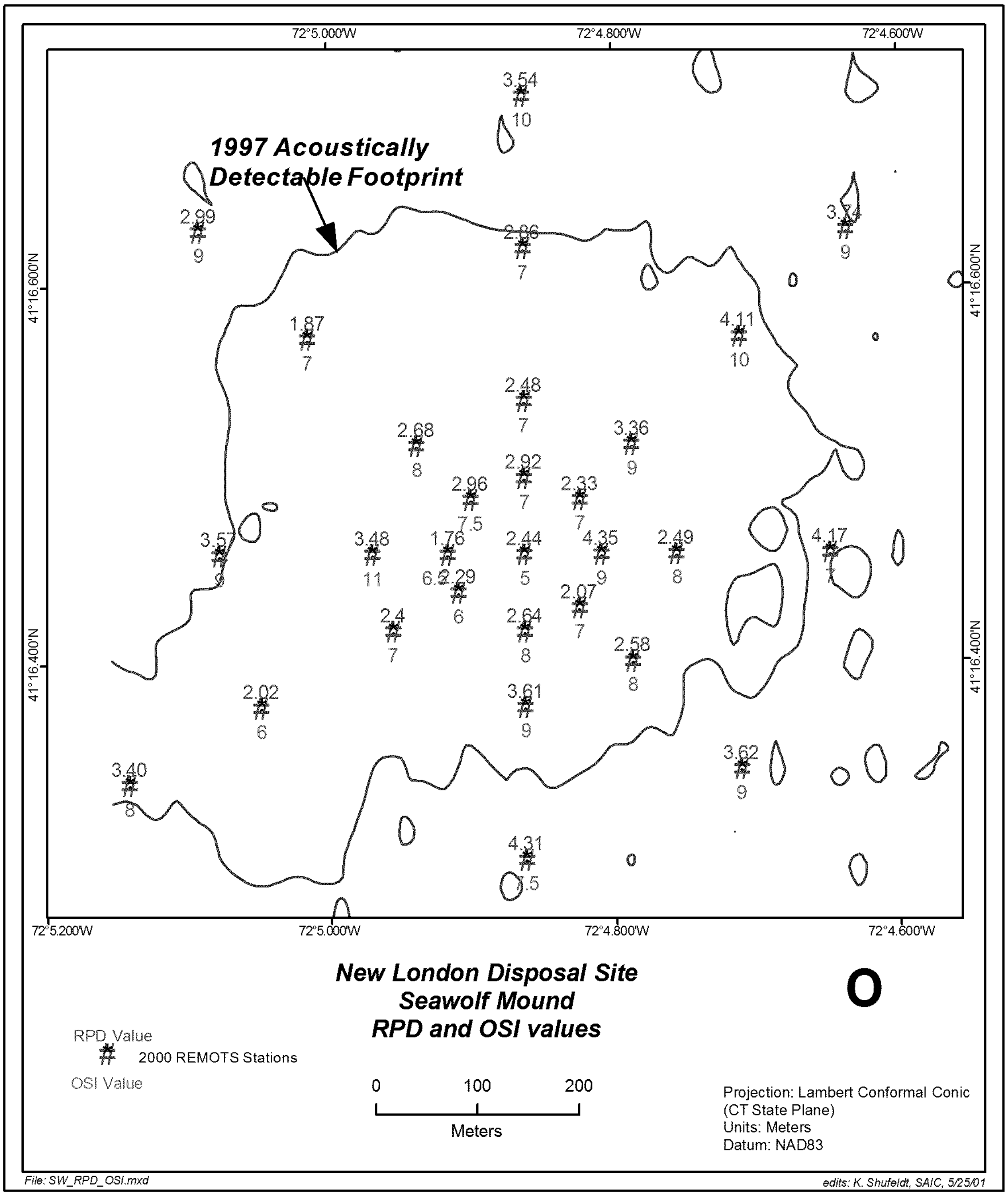


Figure 3-14. Map of replicate-averaged RPD depths and median OSI values calculated for the REMOTS® stations occupied over the Seawolf Mound.

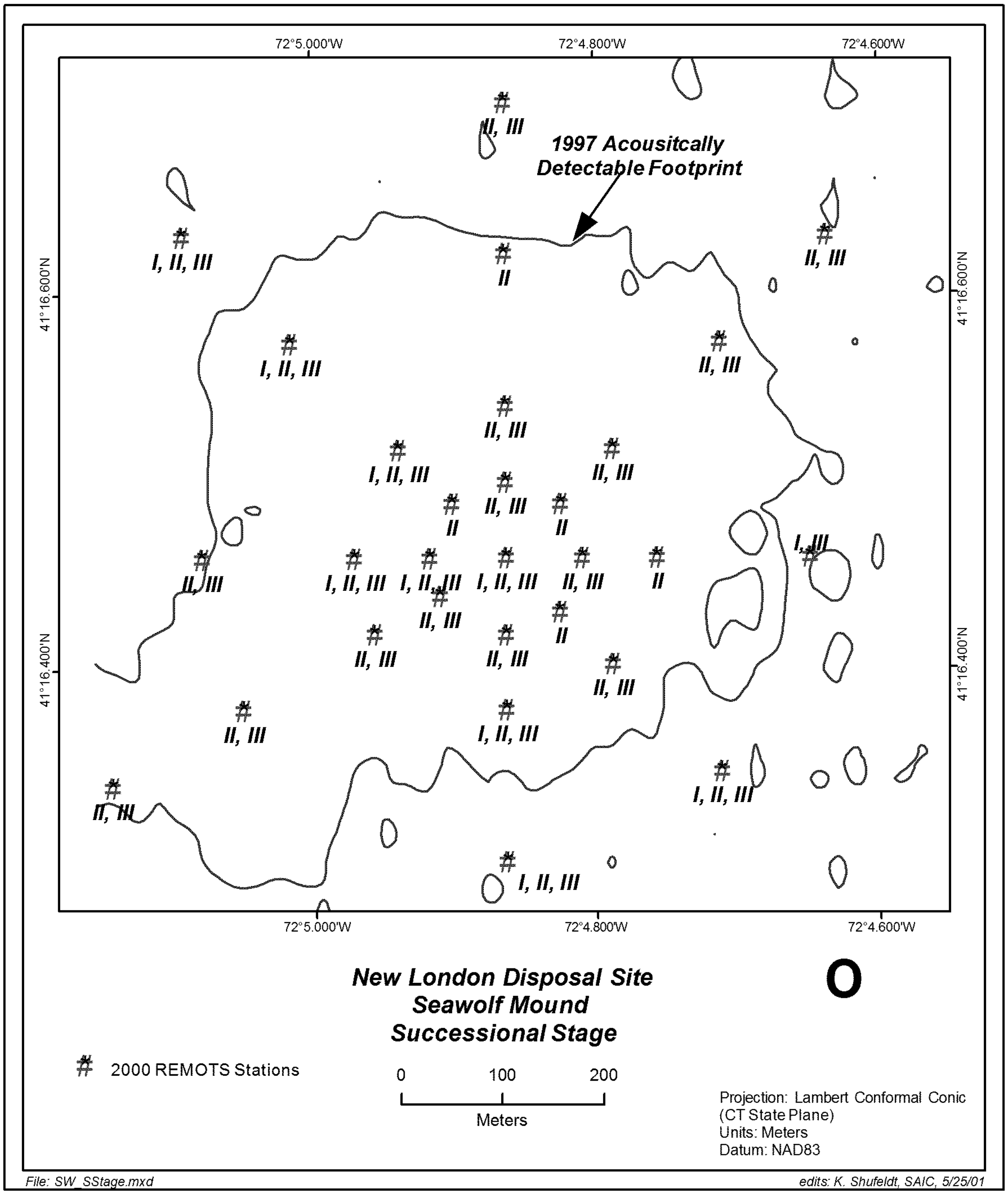


Figure 3-15. Map of successional stage assemblages detected at the REMOTS® stations occupied over the Seawolf Mound.

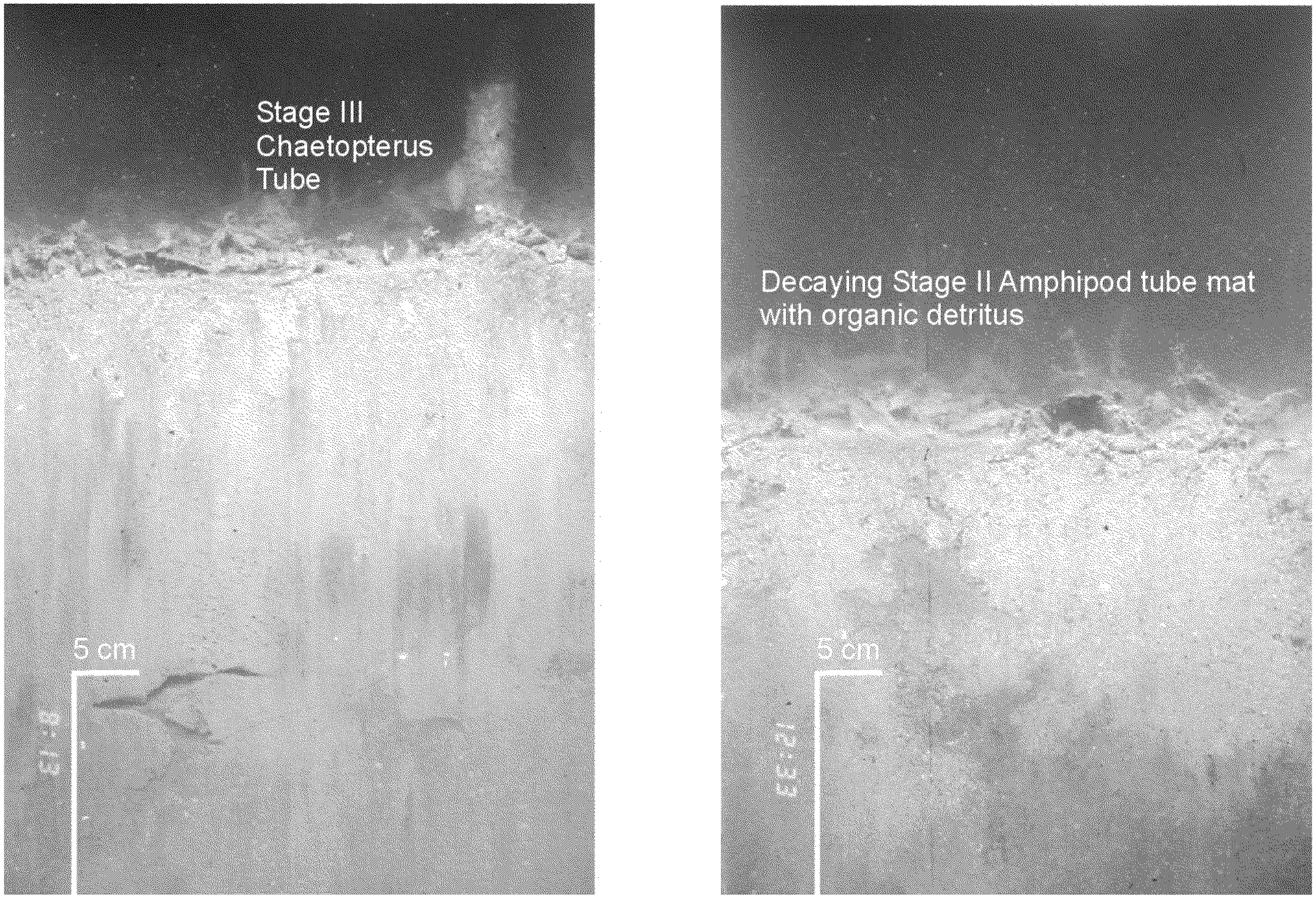


Figure 3-16. REMOTS® images obtained over the Seawolf Mound displaying the different types of surface tubes constructed by individuals of advanced successional stages. (**A**) Large Stage III *Chaetopterus sp.* tube surrounded by mature Stage II *Ampelisca sp.* surface tubes at Station 150WSW. (**B**) Decaying Stage II amphipod (*Ampelisca sp.*) tube mat and organic detritus at Station 300E.

The median of replicate OSI values ranged from +5 to +11, with an overall average of nearly +8 (Figure 3-14; Table 3-3). The Seawolf Mound median OSI values were greater than the values of the ambient sediments observed at the reference areas, which varied between +5 to +9 (+7 average; Table 3-2).

3.3 USCGA Mound

REMOTS sediment-profile imaging was used to document the status of benthic recolonization over the USCGA Mound five years after the development of the mound on the NLDS seafloor. A complete set of REMOTS image analysis results for the USCGA Mound is provided in Appendix B.

The USCGA mound primarily consisted of sandy fine-grained sediments (grain size major mode of >4 phi; Table 3-4). Consolidated clay or clayey mud was observed in five images over the mound. All of the sediment that was observed in the images collected at this mound was considered to be historic dredged material, having a thickness exceeding the camera penetration depth (Table 3-4). Boundary roughness was low and uniform for most stations, ranging from 0.7 to 2.6 cm (1.4 cm average). Boundary roughness was primarily due to biogenic activity (surface tubes).

Over the USCGA Mound, the replicate-averaged RPD for each REMOTS station ranged from 1.04 to 5.74 cm (Figure 3-15; Table 3-4). The average RPD, 3.80 cm, was greater than the average RPD from the reference areas (2.66 cm). There was no evidence of low dissolved oxygen (DO) conditions or methane bubbles observed in the USCGA Mound sediment profile images obtained in August 2000.

The successional status was advanced, with Stage II or Stage II on III communities observed over the mound (Figure 3-17; Table 3-4). Stage III organisms were present at 10 of 13 stations. The various stages of the amphipod life cycle (juvenile, adult, and decaying tube mats) were also apparent, and the mats appeared to be undisturbed by physical forces. Similar to the Seawolf Mound, large tubes of the polychaete *Chaetopterus* sp were observed in a few of the images over the surface of the mound (Figure 3-19). The presence of this Stage III organism is indicative of advanced benthic recolonization over the USCGA Mound.

The median of replicate OSI values ranged from +6 to +11, with an overall average of +9 (Table 3-4). The lowest OSI values were observed at 50N (+6) and 100N (+7), but still indicate healthy benthic conditions. The USCGA average OSI value was greater than both the reference area average (+7) and the average observed in August 1995 (+6). Overall, these results suggest the rapid benthic recolonization of this mound detected in the initial survey continued without degradation over the past five years.

Table 3-4
Summary of REMOTS□ Data Collected at the USCGA Disposal Mound

USCGA Station	Number of Replicates Analyzed	Camera Penetration Mean (cm)	Dredged Material Thickness Mean (cm)	Number of Replicates w/Dredged Material Present	RPD Mean (cm)	Successional Stages Present	Highest Successional Stage Present	Grain Size Major Mode (phi)	OSI Mean	OSI Median	Boundary Roughness Mean (cm)
CTR	3	16.29	>16.29	3	4.28	II	ST_II	>4	8	9	0.69
050N	3	12.94	>12.94	3	1.04	II, III	ST_II_ON_III	>4	6	6	0.67
050E	3	16.16	>16.16	3	5.74	I, II	ST_II	>4	8	9	1.10
050SE	3	14.24	>14.24	3	2.97	I, II, III	ST_I_ON_III	>4	8	8	1.13
050S	3	15.86	>15.86	3	4.59	I, II, III	ST_I_ON_III	>4	9	9	1.42
050W	3	16.37	>16.37	3	4.41	I, II, III	ST_II_ON_III	>4	9	9	1.04
100N	5	16.70	>16.70	5	2.75	II	ST_II	>4	7	7	1.54
100E	3	14.30	>14.30	3	4.51	I, II, III	ST_III	>4	9	9	2.62
100SE	5	14.06	>14.06	5	3.95	I, II, III	ST_II_ON_III	>4	9	9	1.91
100S	5	14.18	>14.18	5	2.44	II, III	ST_II_ON_III	>4	8	9	1.37
100W	3	16.11	>16.11	3	4.82	II, III	ST_II_ON_III	>4	10	11	1.62
150E	3	10.37	>10.37	3	3.63	II, III	ST_II_ON_III	>4	9	9	1.71
150S	4	16.95	>16.95	4	4.30	II, III	ST_II_ON_III	>4	10	11	1.22
AVG	4	14.96	14.96	4	3.80				9	9	1.39
MAX	5	16.95	16.95	5	5.74				10	11	2.62
MIN	3	10.37	10.37	3	1.04				6	6	0.67

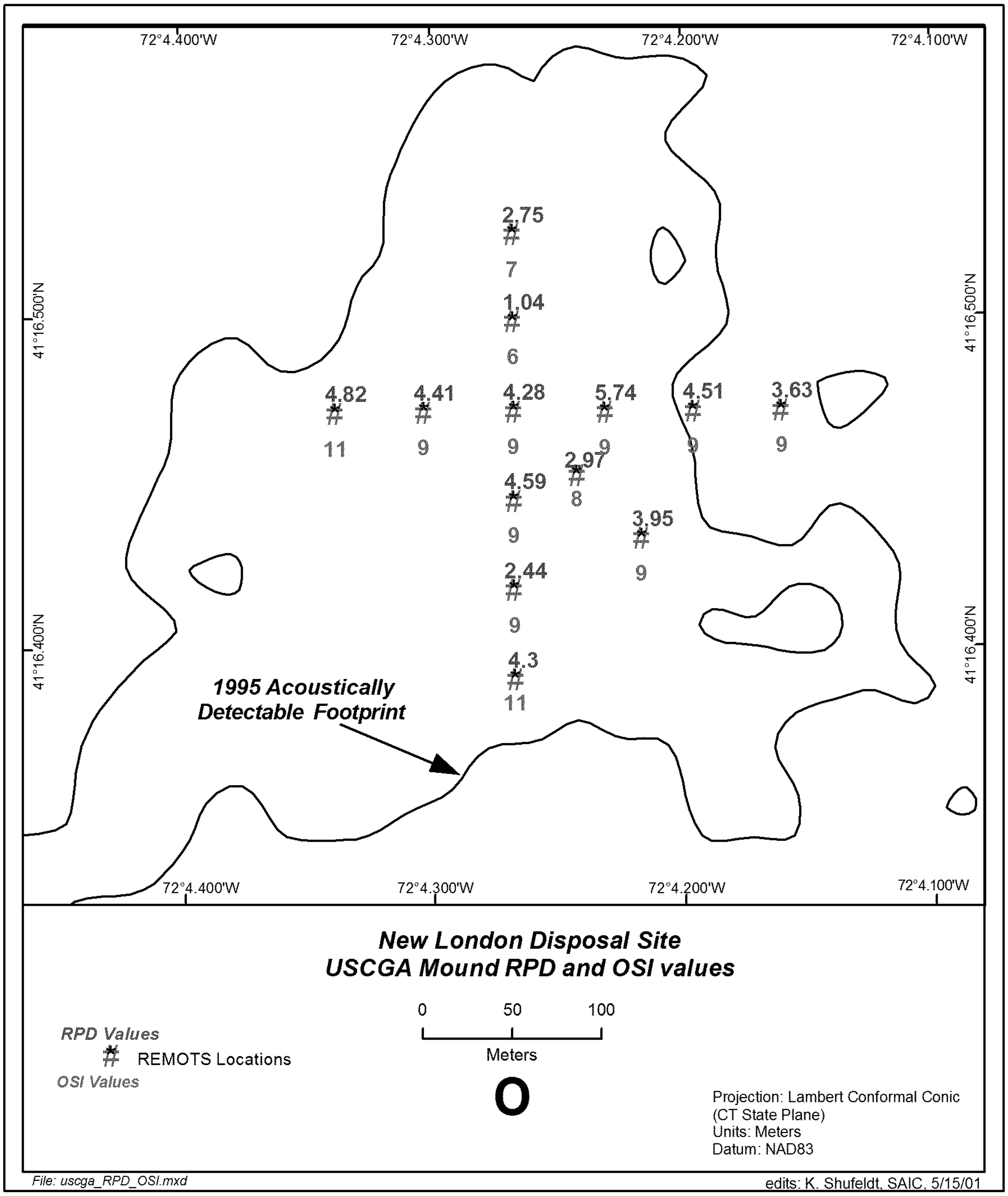


Figure 3-17. Map of replicate-averaged RPD depths and median OSI values calculated for the stations occupied over the USCGA Mound

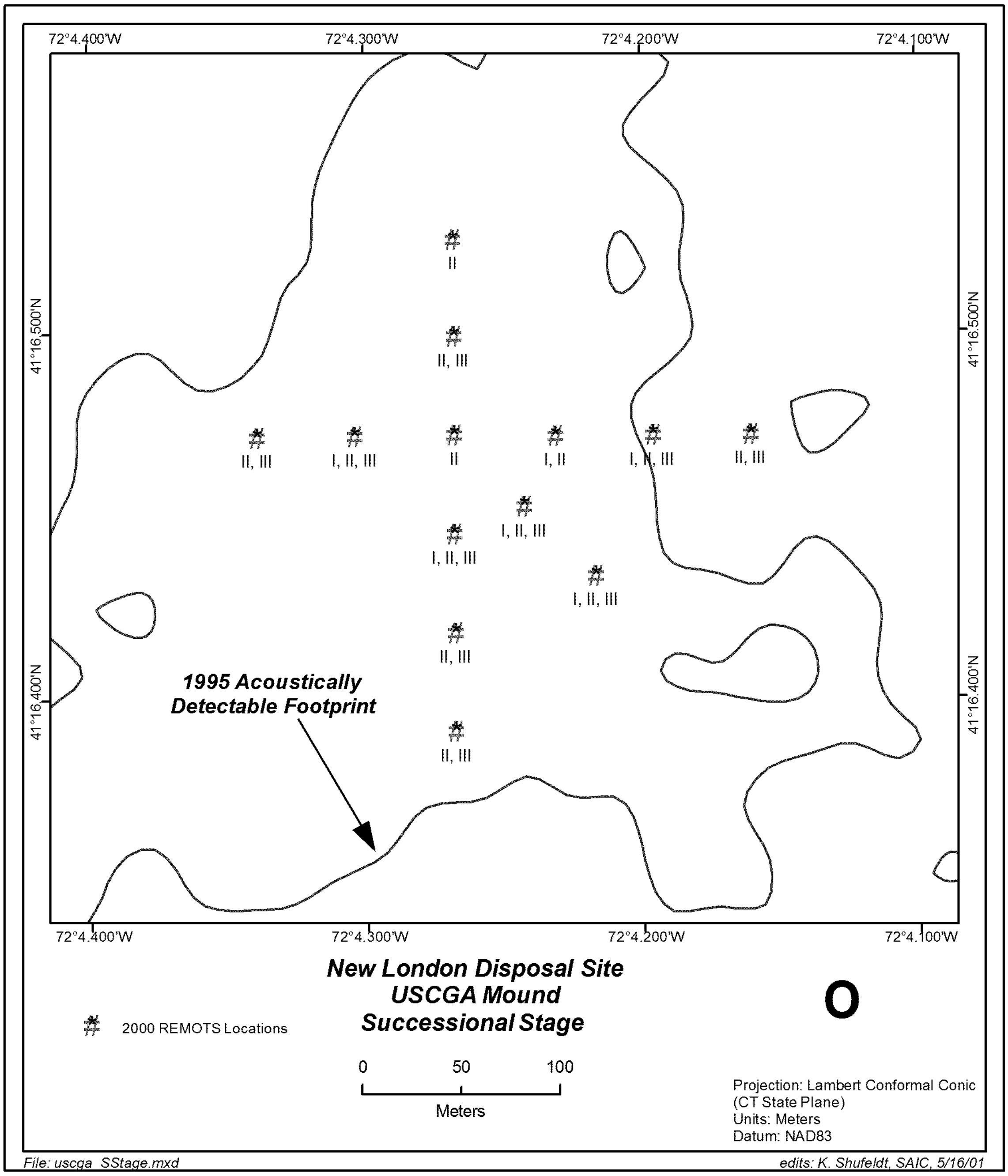


Figure 3-18. Map of successional stage assemblages detected at the REMOTS® stations occupied over the USCGA Mound.

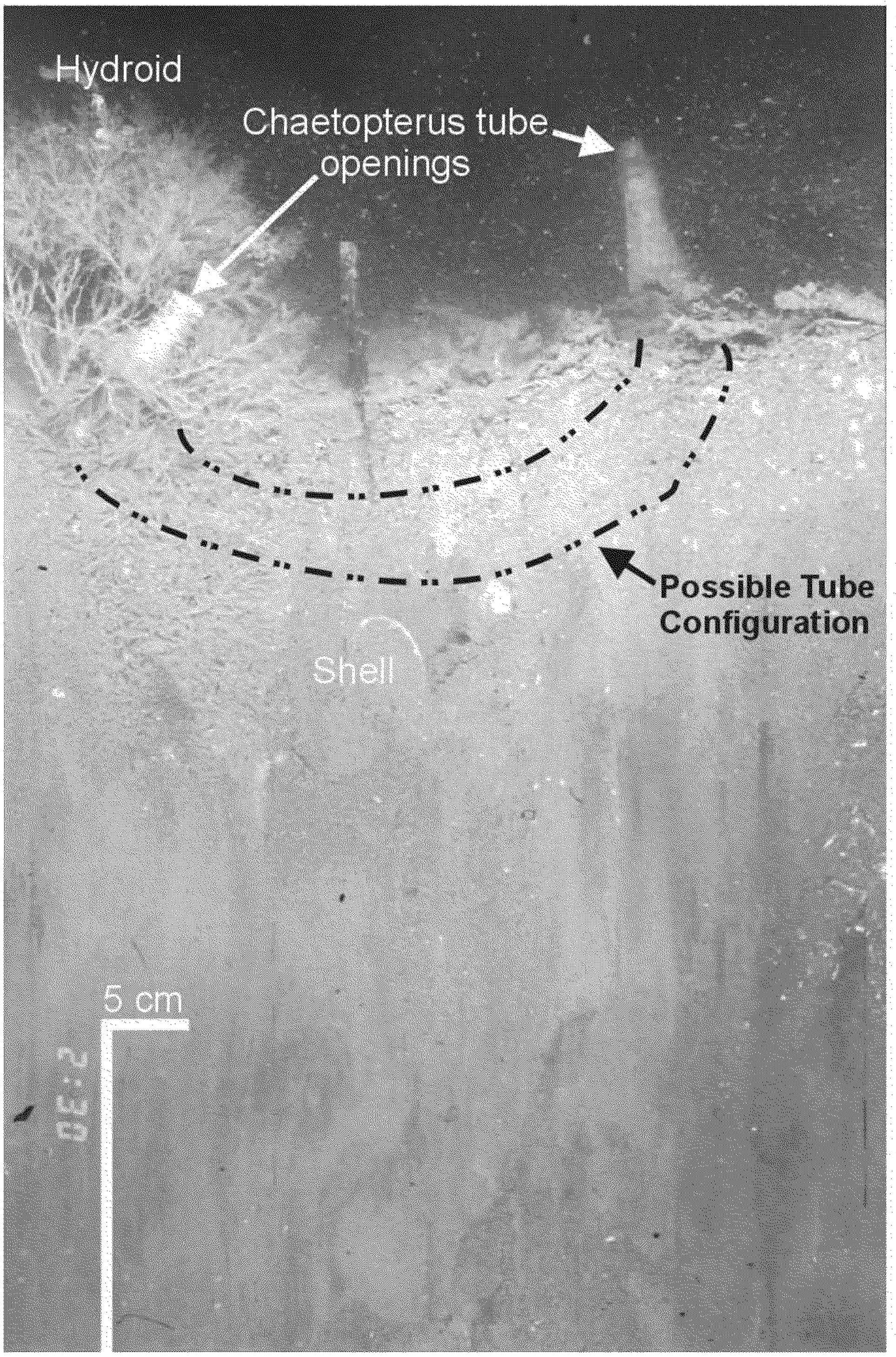


Figure 3-19. REMOTS® image obtained at USCGA Station 100SE, Replicate A displaying two *Chaetopterus sp.* constructed tubes, or potentially the two exposed ends of a single U-shaped tube.

3.4 Reference Areas

Three reference areas for NLDS (NLON REF, NEREF, and WESTREF) were surveyed with the REMOTS sediment-profile camera. These reference areas provide a basis for comparison in evaluating the overall health of the benthic community at NLDS. A total of thirteen stations were surveyed. A complete set of image analysis results is provided in Appendix B.

Surface sediments at the three reference areas were predominantly muddy (i.e., silt/clay), with a grain size major mode of >4 phi (Table 3-2). There appeared to be a significant component of very fine sand mixed with the silt/clay at almost all of the reference area stations (i.e., "sandy mud"). One station at NLON-REF contained predominantly very fine sand (4 to 3 phi). In many of the images, sandy mud over mud stratigraphy was observed, and organic detritus and/or shell fragments were present at the sediment surface. Similar to observations at the disposal mounds, a depositional layer of organic detritus and both decaying and intact amphipod tube mats were observed at the sediment surface at many stations. There was no evidence of dredged material observed in any of the reference area images.

The RPD depths at the reference area stations ranged from 1.96 to 3.58 cm, with an overall average of 2.66 cm (Table 3-2). These values suggest good oxygen penetration into the sediment, and there was no evidence of any low dissolved oxygen conditions. Stage II was the dominant successional stage; active Stage III feeding voids were observed at only five of the thirteen stations. Many juvenile amphipod mats were common at NE-REF. Decayed mats and juvenile amphipods were apparent at NLON-REF and WEST-REF. Two images from Station WR-5 in WEST-REF also showed small clumps of mussels (likely *Modiolus sp.*) inhabiting the surface sediments (Figure 3-20 A and B).

The OSI median values ranged from +5 to +9 (average of +7) and were very similar to values observed in 1997 and 1998. Overall, the average OSI value of +7 suggests relatively healthy or undisturbed benthic habitat quality at the three NLDS reference areas at the time of the August 2000 survey.

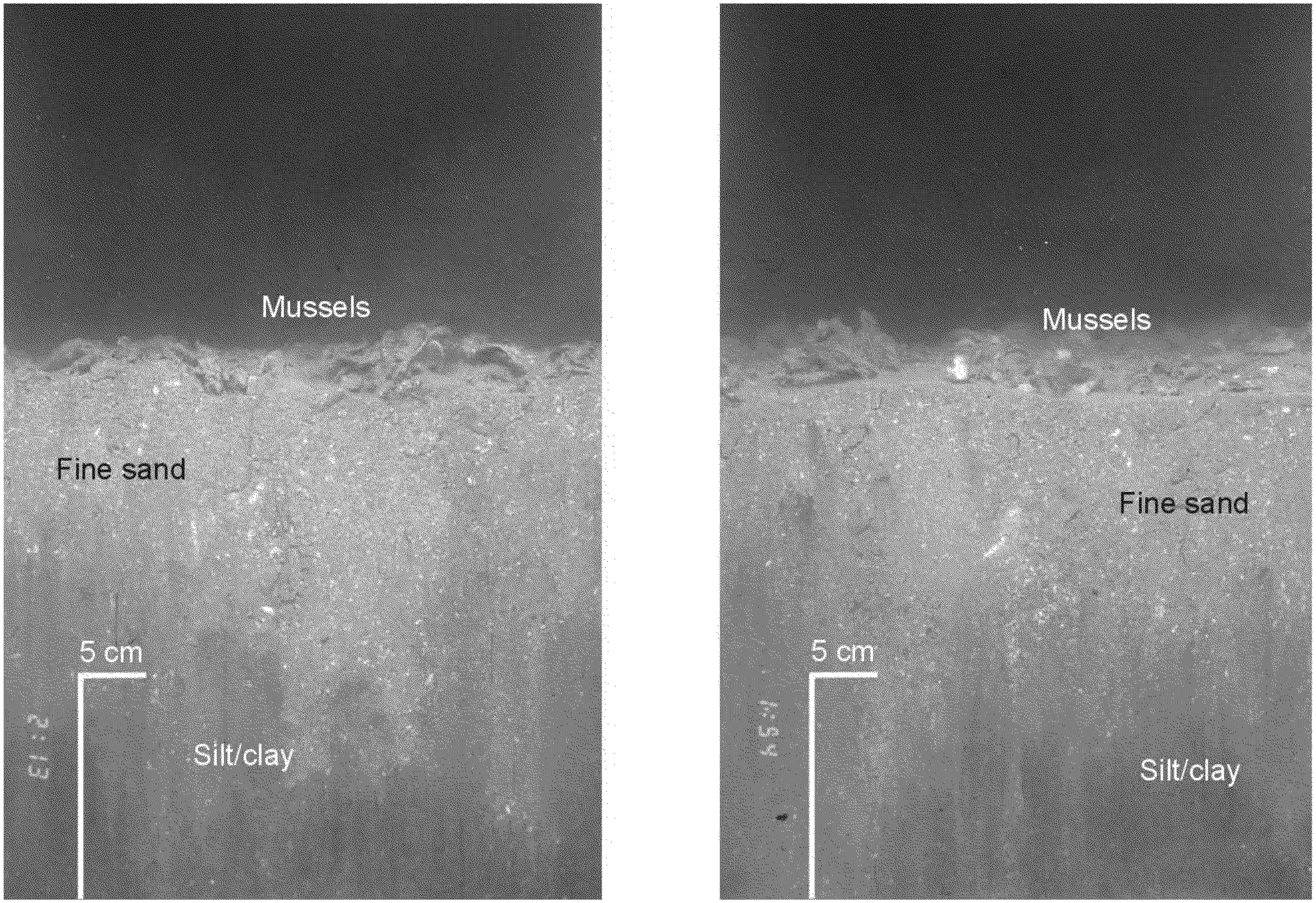


Figure 3-20. REMOTS® sediment-profile photographs collected at WEST-REF Station WR-5, Replicates B and D displaying small clumps of mussels actively filter-feeding at the sediment-water interface.

4.0 DISCUSSION

The development of distinct disposal mounds on the NLDS seafloor through controlled placement of dredged material serves several purposes:

1) The short-term impacts associated with dredged material disposal are highly localized, allowing the productivity of the rest of the seafloor to remain unaffected.

2) The individual sediment deposits can be monitored as independent bottom features over the course of several years without being influenced by new dredged material deposition.

3) Dredged material mounds can be strategically placed on the seafloor to construct artificial containment cells to be used as part of large-scale capping projects.

4) Many small- to moderate-sized disposal mounds tend to maximize the capacity of a disposal site and adhere to site-specific minimum depth requirements.

The August 2000 survey over NLDS was conducted as part of a long-term monitoring initiative for three capped disposal mounds developed within the confines of the site (NL-91 and D/S, Seawolf, and USCGA). Each mound was constructed under a separate set of project conditions (sediment type, disposal volume, placement pattern, etc.) and, therefore, each has a unique history and character. Both the Seawolf and USCGA Mounds have been in place on the seafloor for over 5 years, allowing ample time for dredged material consolidation and full benthic community recovery. The NL-91 and D/S Mound Complex was originally constructed during the 1991-1992 disposal season. Monitoring data collected in August 1992 showed benthic recolonization to be within normal parameters, but it was recommended that cap material thickness be increased (SAIC 2001a). Supplemental capping has been on-going over this Mound Complex. The results of the August 2000 survey effort at NL-91 and D/S Mound Complex, Seawolf Mound and USGA Mound are discussed below in relation to the monitoring objectives.

4.1 NL-91 and D/S Mound Complex

One objective of the August 2000 bathymetric survey over the NL-91 and D/S Mound Complex was to detect any changes in seafloor topography since September 1997, when the last bathymetric survey was conducted. Since September 1997, a total reported barge volume of approximately 30,000 m^3 of supplemental CDM was placed over the mound complex. The depth difference calculations between the September 1997 and August 2000 bathymetric surveys were successful in detecting several small areas of supplemental CDM accumulation up to 0.5 m thick in the immediate vicinity of the former NDA-91 and D/S buoy locations (Figure 3-2). Placement of the supplemental CDM from several different dredging projects was concentrated around these former buoy locations, which correlates well with the depth difference results (Figure 3-3). Overall, the August 2000 bathymetric survey results serve to verify the prediction that the placement activities since September 1997 would result in an accumulation of supplemental CDM on the seafloor having a thickness on the order of 0.5 m.

A second, related objective of the August 2000 monitoring survey over the NL-91 and D/S Mound Complex was to map the spatial distribution of the supplemental CDM on the seafloor. Aside from the CDM detected through depth difference comparisons, the August 2000 REMOTS photographs identified layers of recently placed (1997-2000) capping material over the majority of the mound complex. Specifically, recently placed CDM was noted at 9 of the 13 REMOTS stations over the NL-91 and D/S mound complex, coinciding very well with the accumulations of CDM detected by bathymetry (Figure 3-4). The combined bathymetry and REMOTS results indicate that the supplemental cap material completely covers the original deposit of UDM that was placed during the 1991-1992 disposal season (Figure 3-4).

A change in surface sediment composition was the primary indicator of recent CDM deposition, as marked by the presence of sandy mud (predominant grain size major mode of >4 phi) comprising the surface sediment during the August 2000 survey where fine sand (4 to 3 phi) existed previously (Table 4-1). The layers of new CDM often exceeded the penetration depth of the REMOTS camera prism, yet were below the threshold of detection for the bathymetric depth difference comparisons. Therefore, while the sediment profile photography results generally coincide with the bathymetric depth difference results, the contour line in Figure 3-4 indicates a wider CDM distribution due to the ability of the sediment profile camera to reveal relatively thin layers which were not detected acoustically.

Over the past few years, Station 100N has been subjected to multiple cap placement events. As a result, the images collected at this station are ideal for tracking the composition of each new layer of CDM placed over the historic mound complex (Figure 4-1). Figure 4-1A depicts the surface of NL-91 and D/S in September 1997 before cap augmentation operations began. A layer of fine sand over silt and clay deposited during the 1991-92 disposal season is visible in this image. Figure 4-1B is a photograph collected in July 1998 after the deposition of over 6,500 m^3 of Shennecossett Yacht Club material near Capping Points 1 and 2 during the 1997-98 disposal season (Figure 3-3). A surface layer composed of medium sand to pebble-sized grains over brown, fine sand indicates the presence of supplemental cap material. The final image (Figure 4-1C), obtained during the August 2000 survey, shows another change in surface sediment composition over Station 100N. A third layer of CDM having a thickness of 9 cm and consisting primarily of silt was detected after

Table 4-1
NL-91 and D/S Mound Complex REMOTS□ Sediment-Profile Photography Results for the 1997, 1998, and 2000 Surveys

Station	Camera Penetration Mean (cm)			Dredged Material Thickness Mean (cm)**			Number of Reps w/Dredged			RPD Mean (cm)		
NL-91 and D/S	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**
CTR	18.42	13.82	**15.87**	>16.82	>13.87	**>15.87**	3	3	**3**	6.17	5.14	**4.92**
100N	14.32	12.85	**13.46**	>14.82	>13.34	**>13.46**	3	3	**4**	6.74	6.07	**3.14**
100E	11.50	13.97	**14.76**	>18.23	>14.01	**>14.76**	3	3	**3**	5.53	6.07	**3.07**
100S	10.87	14.65	**11.94**	>14.18	>14.57	**>11.94**	3	3	**3**	2.19	2.67	**2.70**
100W	17.14	11.40	**10.87**	>10.97	>11.59	**>10.87**	3	3	**3**	6.11	3.23	**3.75**
200N	6.70	9.80	**10.78**	>15.45	>9.71	**>10.78**	3	3	**3**	3.24	2.90	**3.33**
200E	15.10	13.96	**12.25**	>17.26	>13.92	**>12.25**	3	3	**4**	4.92	3.54	**3.76**
200S	6.94	6.51	**12.17**	>6.82	>6.41	**>12.17**	3	3	**3**	3.79	2.59	**4.34**
200W	15.49	8.53	**12.60**	>6.91	>8.83	**>12.60**	3	3	**3**	4.57	3.90	**3.62**
300N	17.70	11.42	**16.79**	>14.11	>11.39	**>16.79**	3	3	**2**	1.03	5.97	**2.83**
300E	14.20	13.87	**13.84**	>15.53	>13.51	**>13.84**	3	3	**3**	5.29	1.17	**1.83**
400E	15.52	14.56	**15.23**	>17.56	>14.35	**>15.23**	5	3	**3**	4.23	1.19	**4.65**
500E	16.94	15.83	**14.35**	>15.35	9.56	**>14.35**	4	2	**3**	4.32	2.61	**2.82**
AVG	13.91	12.40	**13.45**	>14.15	11.93	**>13.45**	3.23	2.92	**3.08**	4.47	3.62	**3.44**
MAX	18.42	15.83	**16.79**	>18.23	>14.57	**>16.79**	5	3	**4**	6.74	6.07	**4.92**
MIN	6.70	6.51	**10.78**	>6.82	9.56	**10.78**	3	2	**2**	1.03	1.17	**1.83**

Table 4-1 (continued)

Station	Successional Stages Present			Highest Stage Present			Grain Size Major Mode (phi)			OSI Median			Boundary Roughness		
NL-91 and D/S	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**
CTR	II, III	I, II	**I, II, III**	ST_II_ON_III	ST_I_TO_II	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	10	8	**9**	1.3	1.0	**1.1**
100N	II, III	I,II	**II**	ST_II_TO_III	ST_II	**ST_II**	4 to 3	4 to 3	**>4**	11	6	**8**	2.0	3.2	**0.7**
100E	I, II, III	I, II, III	**II, III**	ST_I_ON_III	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	10	9	**8**	1.2	1.2	**0.7**
100S	II, III	II	**I, II, III**	ST_II_ON_III	ST_II	**ST_II_ON_III**	4 to 3	>4	**>4**	8.5	7	**8**	1.0	1.6	**0.7**
100W	I, II, III	II, III	**II, III**	ST_II_ON_III	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	9	9	**10**	1.8	1.0	**1.2**
200N	I, II, III	I, II, III	**I, II, III**	ST_II_ON_III	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	7	8	**8**	1.9	1.1	**2.7**
200E	II	I, II, III	**I, II, III**	ST_II	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	9	10	**8**	1.2	1.2	**0.7**
200S	I, II, III	I, II, III	**I, II, III**	ST_II_ON_III	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	11	7	**8**	1.2	1.5	**1.8**
200W	I, II, III	I, II, III	**I, III**	ST_I_ON_III	ST_II_ON_III	**ST_I_ON_III**	4 to 3	4 to 3	**>4**	8.5	9	**9**	2.2	1.8	**0.8**
300N	I, II	I, II, III	**II, III**	ST_II	ST_II_ON_III	**ST_II_ON_III**	>4	4 to 3	**>4**	2	11	**8**	1.3	1.8	**1.9**
300E	I, II, III	I	**I, II, III**	ST_I_ON_III	ST_I	**ST_I_ON_III**	4 to 3	>4	**>4**	8	3	**6**	1.1	1.3	**1.6**
400E	I, II, III	I, II	**I, II, III**	ST_II_ON_III	ST_II	**ST_II_ON_III**	>4	>4	**>4**	7	3	**9**	0.6	1.5	**1.1**
500E	II, III	II, III	**I, II, III**	ST_II_ON_III	ST_II_ON_III	**ST_I_ON_III**	4 to 3	>4	**>4**	9	7	**8**	1.0	1.6	**1.1**
AVG										8.5	7.5	**8.2**	1.39	1.52	**1.24**
MAX										11	11	**10**	2.22	3.20	**2.70**
MIN										2	3	**6**	0.64	1.00	**0.70**

**** Values shown are means for multiple replicate images obtained and analyzed at each station. If dredged material exceeded the prism penetration depth in at least 66% of the replicates for that station, then the mean value shown is a minimum estimate of dredged material layer thickness (indicated by the >sign).**

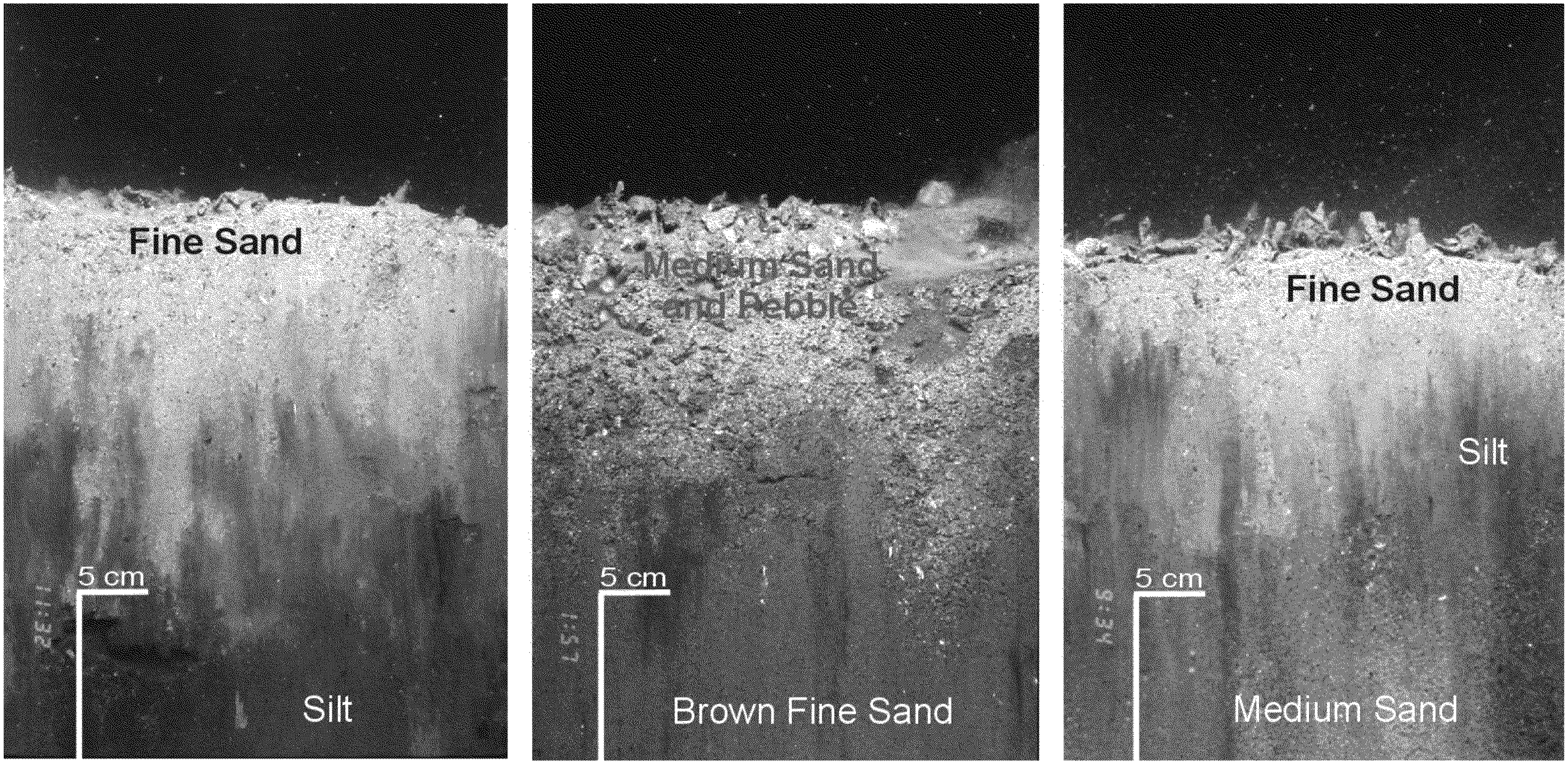


Figure 4-1. A series of REMOTS® sediment-profile photography images collected at NL-91 and D/S Mound Complex Station 100N showing changes in sediment composition between surveys, indicating the deposition of supplemental CDM.

the placement of nearly 24,000 m^3 of dredged material during the 1998-99 or 1999-2000 disposal seasons (Appendix A). The recently deposited silt overlays a horizon of medium sand at depth, which is likely a component of the 1997-98 sediments.

A final objective of the August 2000 monitoring survey was to determine the benthic recolonization status of the NL-91 and D/S Mound Complex, through comparisons with previous surveys and results from nearby reference areas. Overall, the benthic habitat conditions over the NL-91 and D/S Mound complex in August 2000 were found to be relatively healthy or undisturbed, with OSI values ranging from +6 to +10. The overall average OSI value for the disposal mound stations (+8.0) was slightly higher than the reference area average of +7.0, indicating that benthic habitat quality over the mound was comparable to that on the ambient seafloor at the time of the survey. The August 2000 OSI average of +8.0 is also comparable to the averages for the 1997 and 1998 surveys (+8.5 and +7.5, respectively; Table 4-1). This suggests that benthic habitat quality in general has been consistently healthy at this mound since the previous surveys in 1997 and 1998.

The bulk of the supplemental cap material was placed during the period 1997 to 1999 (Appendix A), therefore, the August 2000 survey occurred after this material had been in place on the seafloor for over one year. It was predicted that the recolonization status of the NL-91 and D/S Mound complex more than one year following cap material placement would be advanced, with a community comprised of Stage II and Stage III organisms. The August 2000 results confirmed this prediction: both Stage II and III organisms appeared to be abundant in the sediment profile images obtained at stations across the mound (Figure 3-7). Stage II on III has been observed consistently at this mound since 1997 (Table 4-1). As in previous surveys, the Stage II community in August 2000 was comprised predominantly of the amphipod *Ampelisca* sp, which formed dense tube mats at the sediment surface. At the time of the survey, these tube mats appeared to be in various stages of decay and re-generation, consistent with the cyclic nature of Ampeliscid amphipod populations (Figure 3-8). The widespread presence of decayed amphipod tubes and detritus at the sediment surface suggests that conditions in and around the NLDS were relatively quiescent in the weeks leading up to the August 2000 survey, allowing the organic debris to accumulate on the bottom. It is concluded that the supplemental CDM placed intermittantly over the NL-91 and D/S mound complex since 1997 had been recolonized to an advanced degree by both Stage II and III organisms in August 2000.

Although not directly affected by the placement of supplemental cap material, several stations on the periphery of the REMOTS® survey grid have shown significant improvement in benthic habitat quality, relative to previous surveys. Stations 300E and 400E are located over an area of seafloor that received CDM in 1992 from the Dow Chemical project. In 1995, the data collected from these stations indicated benthic habitat recovery was proceeding as anticipated (SAIC 2001a). Again in 1997, Stations 300E and 400E displayed healthy benthic conditions with deep RPD depths, evidence of Stage III activity, and correspondingly high OSI values (Table 4-1). The 1998 REMOTS® data acquired for these stations showed a sharp decline in benthic habitat conditions, as OSI values of +3 were calculated for both stations. This decline was primarily due to the apparent lack of Stage III activity and shallow RPD depths (Figure 4-2A). The data collected over 300E and 400E during the August 2000 survey showed marked improvement over the 1998 results, with a significantly deeper RPD, evidence of Stage III activity, and corresponding OSI values increasing to +6 and +9, respectively (Figure 4-2B; Table 4-1).

This cyclic deterioration and recovery within dredged sediments deemed suitable for unconfined openwater disposal is not common, but has been documented at other disposal sites in Long Island Sound. A similar condition exists at Station 200N on the New Haven 1993 (NHAV 93) mound at the Central Long Island Sound Disposal Site (CLIS; Morris 1998). At CLIS, this phenomenon seems to be a function of sediment oxygen demand (SOD) within the organically enriched material and the timing of survey activity relative to the onset of seasonal hypoxia. However, seasonal hypoxia has not been viewed as a significant issue at NLDS, due to the amount of water exchange between eastern Long Island Sound and open water (Block Island Sound). Although the material that comprises the eastern lobe of the NL-91 and D/S Mound Complex probably contains high concentrations of labile organic matter, the benthic habitat conditions detected at 300E and 400E in 1998 is likely the result of a recent, localized physical disturbance (e.g., predator foraging or fishing activity). Future monitoring surveys over the NL-91 and D/S Mound Complex should continue to evaluate benthic conditions over the eastern lobe of this bottom feature to verify continued recovery.

Both the bathymetry and REMOTS® monitoring results from the August 2000 survey indicate that the supplemental cap material placed since 1997 covers the original UDM footprint. It is recommended that any future placement of supplemental cap material, designed to augment the total cap thickness, be directed to the area around the former D/S buoy location. In this area, a layer of supplemental cap material was detected in the August 2000 REMOTS® images, but this layer was not yet thick enough to be detected acoustically (Figure 3-4). Specifically, it is recommended that the two points (A and B) shown in Figure 4-3 be used for future supplemental cap material placement over the NL-91 and D/S Mound Complex.

4.2 Seawolf Mound

In 1997, the Seawolf Mound was a recent dredged material deposit that displayed a significant amount of consolidation in the one year period following its creation. The surface CDM layer was composed of dense, gray clay that was exerting pressure on a relatively large deposit of silt (UDM). Apparent reductions of mound height on the order of 0.25 m were detected over most of the disposal mound, with as much as 1.5 m of consolidation calculated over the apex (Figure 4-4A; SAIC 2001b). In contrast, depth difference comparisons

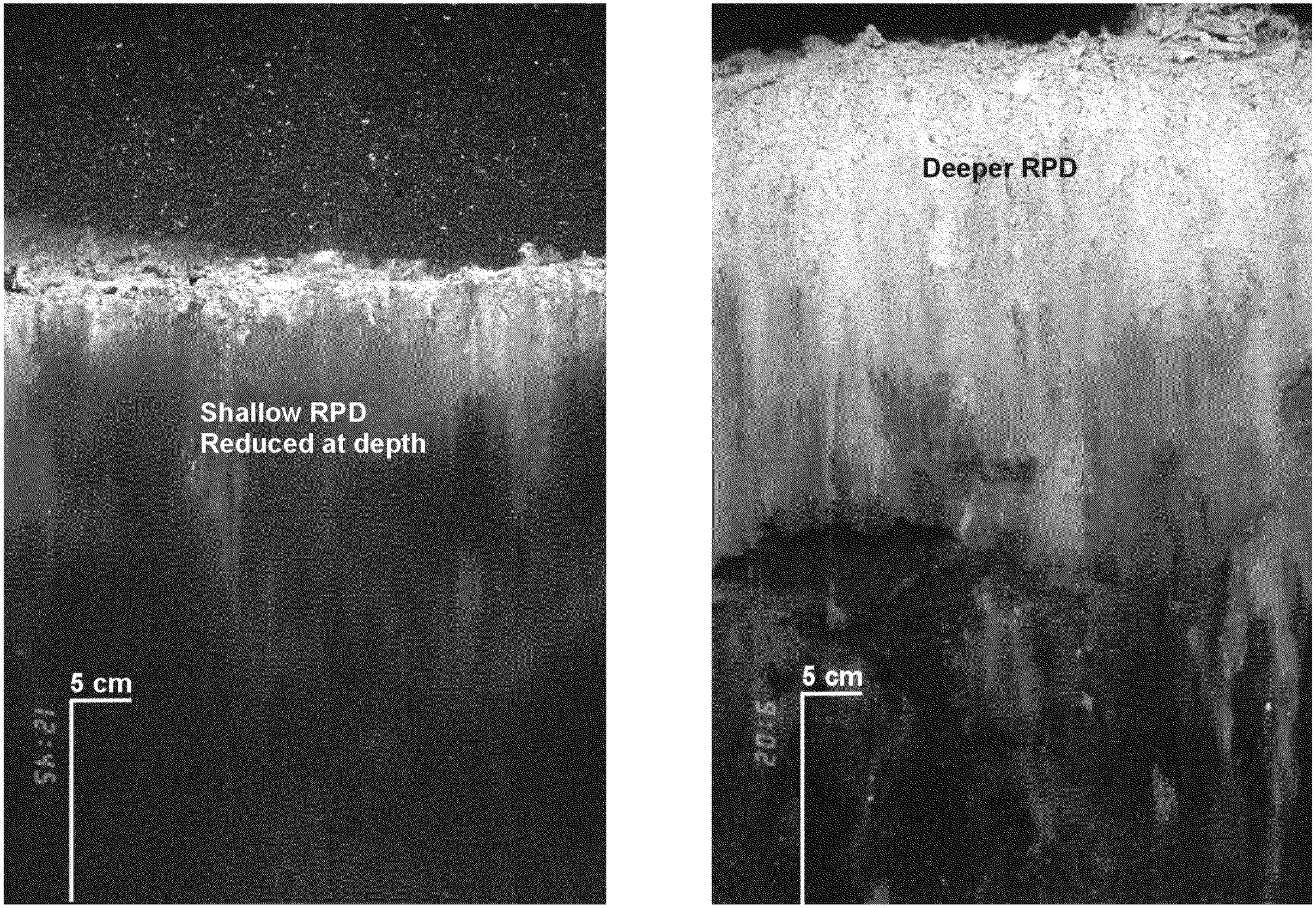


Figure 4-2. REMOTS® sediment-profile images collected over the NL-91 and D/S Mound Complex Station 400E during the (**A**) July 1998 survey and (**B**) August 2000 survey showing the apparent improvement of benthic habitat conditions.

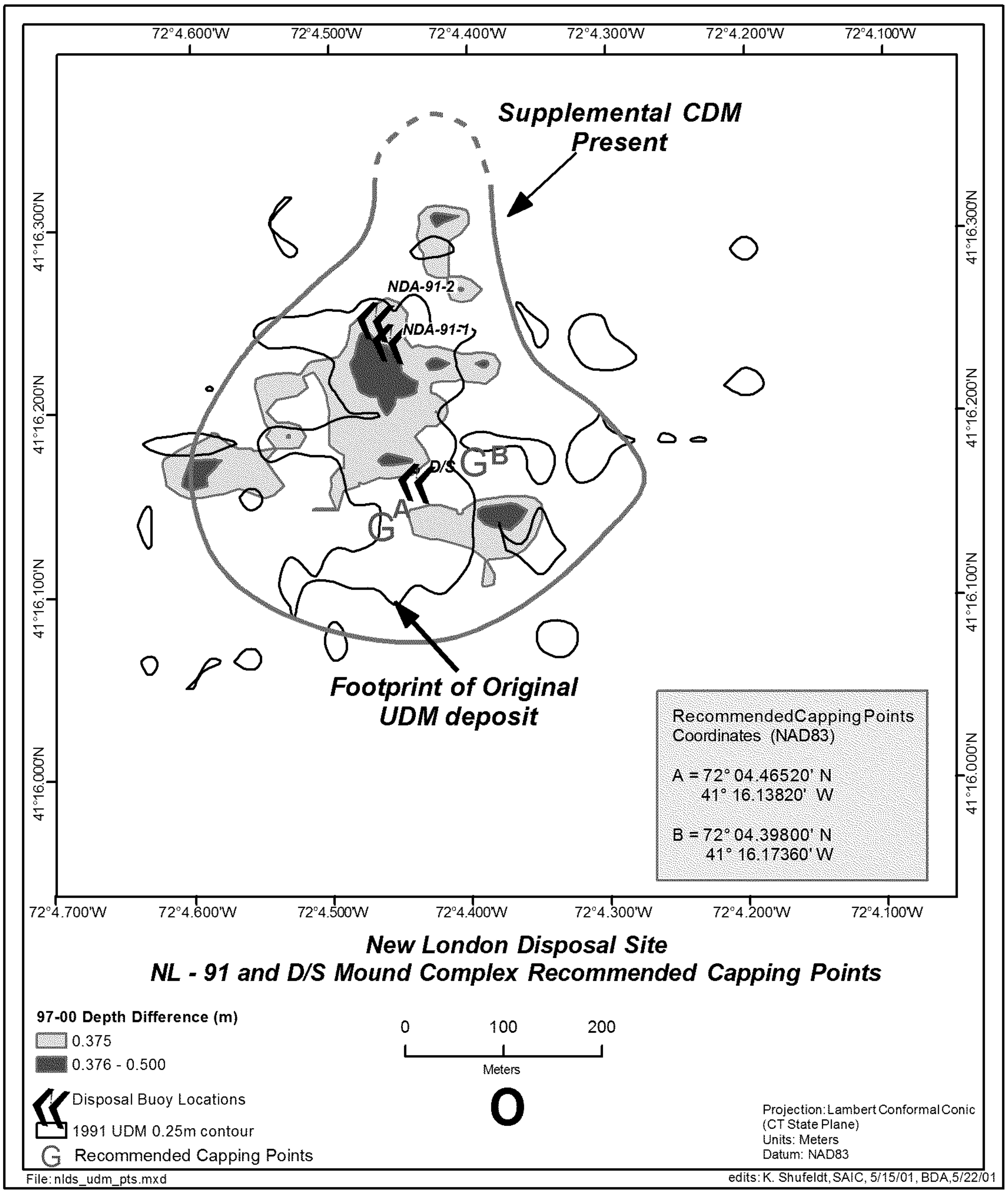


Figure 4-3. Map showing the distribution of supplemental CDM at the NL-91 and D/S Mound Complex based on a combination of the 1997-2000 bathymetric depth difference results and the August 2000 REMOTS® results (green contour line). Recommended points for additional supplemental capping are shown (Points A and B).

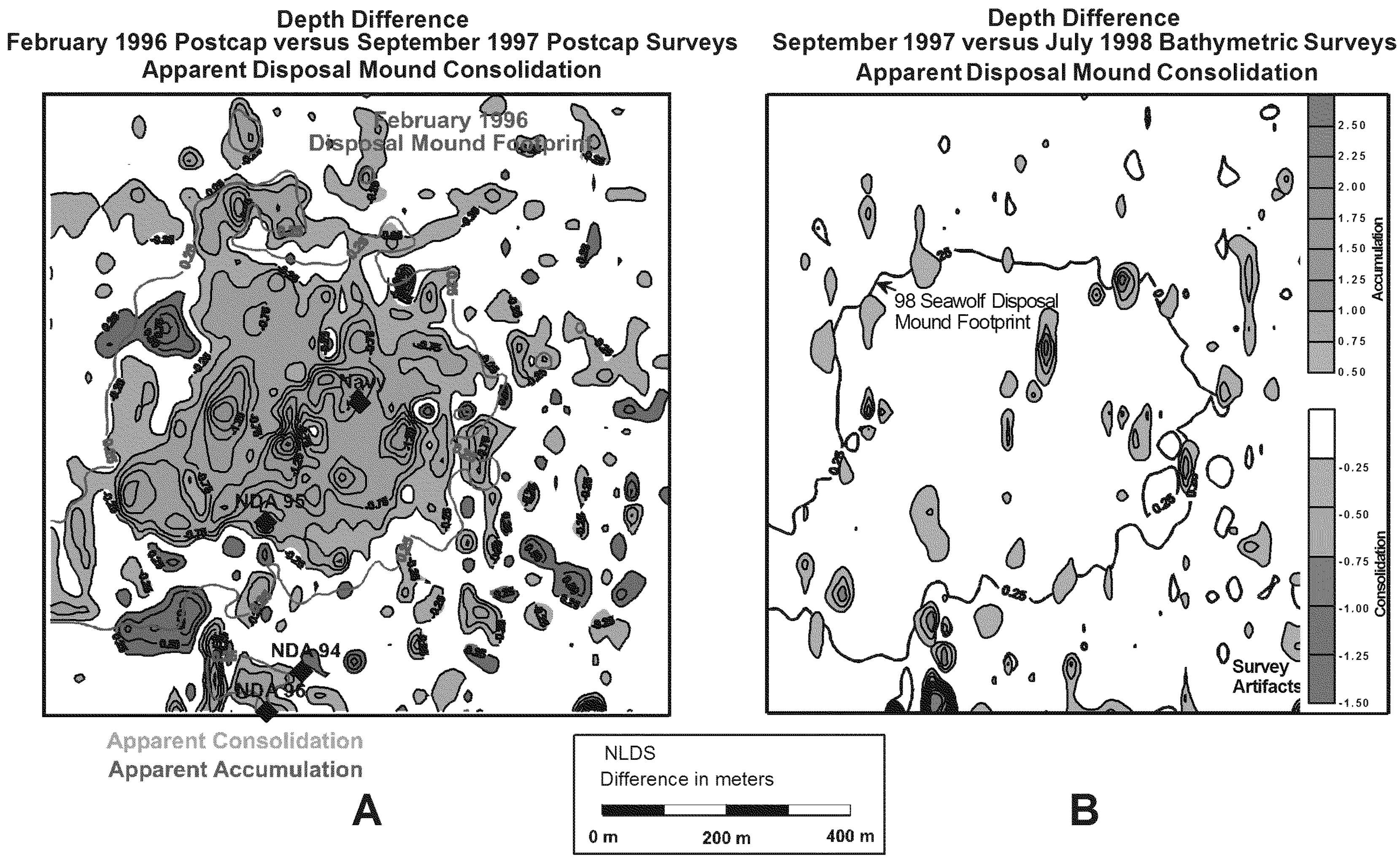


Figure 4-4. Seawolf Mound depth difference comparisons based on sequential bathymetric surveys displaying changes in disposal mound consolidation rates for (**A**) 1996 to 1997 (first year) versus (**B**) 1997 to 1998 (second year).

between the 1997 and 1998 bathymetric datasets displayed only isolated patches of consolidation of approximately 0.25 m (Figure 4-4B; SAIC 2001).

The objective of the August 2000 bathymetric survey at the Seawolf Mound was to detect any changes in topography relative to the last survey of July 1998. The comparison between the two surveys failed to detect any significant topographic changes in the mound, over and above the artifacts or "noise" associated with the depth differencing procedure (Figure 3-10). These results are consistent with those obtained in July 1998, in showing that consolidation of the Seawolf Mound was greatest in the year following its creation but has slowed significantly since September 1997. Past studies of dredged material mound consolidation also serve to demonstrate that consolidation rates are highest immediately following mound creation and then become significantly reduced with time (Poindexter-Rollings 1990; Brandes et al. 1991; SAIC 1997, 1998). Therefore, the August 2000 depth difference results showing no significant consolidation since July 1998 were within expectations for a mound that was 4 years old at the time of the survey.

The objective of the August 2000 sediment profile photography survey over the Seawolf Mound was to determine its benthic recolonization status relative to previous surveys and the nearby reference areas. Overall, the results indicate that overall benthic habitat quality over the mound was slightly better than that on the ambient seafloor and had improved somewhat from that observed in September 1997 and July 1998. The average median OSI value of +8.0 for the Seawolf Mound stations is indicative of relatively healthy or undisturbed benthic habitat quality, and is roughly comparable to the average median OSI value of +7.0 for the reference areas. The increase in the average median OSI value from +7.5 in 1997 and +6.1 in 1998 to +8.0 in August 2000 suggests an improvement in overall benthic habitat quality at this mound over the two year period 1998 to 2000 (Table 4-2). This is mainly attributed to deeper RPD depths in August 2000 compared to July 1998, as well as an increase in the number of replicate images showing more advance successional stages (i.e., Stages II and III).

Similar to the NL-91 and D/S Mound Complex, it was predicted that the recolonization status of the Seawolf Mound complex would be advanced, with a community comprised of Stage II and Stage III organisms. The August 2000 results confirmed this prediction, as both Stage II and III organisms were abundant in the sediment profile images across the mound (Figures 3-15 and 3-16). Stage II on III has been observed consistently at this mound since September 1997 (Table 4-2), with the Stage II community comprised predominantly of dense surface mats of the amphipod *Ampelisca* sp. Large tubes of the Stage III polychaete *Chaetopterus* sp. observed at several stations across the mound (e.g., Figure 3-16A) provide further evidence of the advanced stage of benthic recolonization at this mound in August 2000.

Table 4-2
Seawolf Disposal Mound REMOTS® Sediment-Profile Photography Results for the 1997, 1998, and 2000 Surveys

Station		Camera Penetration Mean (cm)			Dredged Material Thickness Mean (cm)**			Number of Reps w/Dredged Material			RPD Mean (cm)			Successional Stages Present			Highest Stage Present			Grain Size Major Mode (phi)			OSI Median			Boundary Roughness (cm)		
Seawolf	**Area**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**	1997	1998	**2000**
CTR	Apex	17.02	15.42	**15.40**	>16.85	>15.15	**>15.40**	3	3	**3**	NA	1.24	**2.44**	INDET	I, II, III	**I, II, III**	INDET	ST_I_ON_III	**ST_I_ON_III**	>4	>4	**>4**	NA	6.5	**5**	1.4	0.4	**1.5**
75N	Apex	13.50	12.83	**11.93**	>13.41	>12.62	**>11.93**	3	3	**4**	1.85	1.26	**2.92**	II, III	I, II	**II, III**	ST_III	ST_II	**ST_II_ON_III**	4 to 3	>4	**>4**	8	4	**7**	1.4	1.3	**2.2**
75NE	Plateau	13.72	15.15	**14.34**	>13.66	>15.07	**>14.34**	3	3	**3**	4.25	1.21	**2.33**	I, II	I, III	**II**	ST_II	ST_I_ON_III	**ST_II**	>4	>4	**>4**	9	6	**7**	0.9	0.7	**3.4**
75E	Plateau	14.85	14.85	**15.88**	>14.94	>14.64	**>15.88**	3	3	**3**	0.71	1.63	**4.35**	I, II, III	II, III	**II, III**	ST_II_TO_III	ST_II_ON_III	**ST_II_ON_III**	>4	>4	**>4**	5.5	7.5	**9**	0.8	0.8	**0.9**
75SE	Plateau	13.71	13.57	**15.43**	>13.54	>13.46	**>15.43**	3	3	**3**	1.51	1.44	**2.07**	I, II, III	I, III	**II**	ST_III	ST_I_ON_III	**ST_II**	4 to 3	>4	**>4**	6	8	**7**	1.0	0.7	**1.7**
75S	Plateau	12.69	14.39	**14.38**	>12.70	>14.55	**>14.38**	3	3	**3**	1.54	3.29	**2.64**	II, III	I, II	**II, III**	ST_II_ON_III	ST_II	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	6.5	7	**8**	1.2	1.6	**1.8**
75WSW (98 2 rep)	Plateau	15.23	12.80	**16.42**	>15.16	>12.75	**>16.42**	3	2	**3**	1.03	0.3	**2.29**	II, III	I, III	**II, III**	ST_II_TO_III	ST_I_ON_III	**ST_II_ON_III**	>4	>4	**>4**	5.5	6	**6**	0.8	1.2	**1.2**
75W	Plateau	16.63	14.79	**14.85**	>16.57	>14.71	**>14.85**	3	3	**4**	0.98	1.66	**1.76**	I, II, III	I, II	**I, II, III**	ST_I_ON_III	ST_II	**ST_II_ON_III**	>4	>4	**>4**	7	6	**7**	1.3	0.8	**0.9**
75NW	Plateau	14.24	12.24	**16.43**	>14.31	>12.28	**>16.43**	3	3	**4**	1.48	1.07	**2.96**	II, III	I, III	**II**	ST_II_TO_III	ST_I_ON_III	**ST_II**	>4	>4	**>4**	6	5	**8**	0.9	1.9	**1.2**
150N	Apex	11.12	13.16	**15.33**	>11.19	>13.27	**>15.33**	3	3	**3**	NA	1.76	**2.48**	II	AZOIC, I	**II, III**	ST_II	ST_I	**ST_II_ON_III**	>4	>4	**>4**	NA	4	**7**	0.8	2.1	**1.4**
150NE	Plateau	14.65	12.08	**15.28**	>14.76	>12.05	**>15.28**	3	3	**3**	1.31	0.81	**3.36**	III	I, II, III	**II, III**	ST_III	ST_II_ON_III	**ST_II_ON_III**	>4	>4	**>4**	6	7	**9**	1.3	1.1	**1.2**
150E	Plateau	14.30	15.78	**14.83**	>14.16	>15.59	**>14.83**	3	3	**3**	2.07	1.19	**2.49**	I, II, III	I, II, III	**II**	ST_II_TO_III	ST_II_TO_III	**ST_II**	>4	>4	**>4**	7	4	**8**	1.0	0.8	**1.3**
150SE	Plateau	14.52	13.01	**14.54**	>14.41	>12.94	**>14.54**	3	3	**3**	5.01	1.46	**2.58**	I, II, III	I, II, III	**II, III**	ST_I_ON_III	ST_I_ON_III	**ST_II_ON_III**	4 to 3	>4	**>4**	8.5	5	**8**	1.0	0.9	**1.2**
150S	Plateau	14.23	13.53	**13.12**	>14.34	>13.31	**>13.12**	3	3	**3**	4.81	3.75	**3.61**	I, II, III	II, III	**I, II, III**	ST_II_ON_III	ST_II_ON_III	**ST_II_ON_III**	4 to 3	>4	**>4**	11	9	**9**	0.8	0.7	**1.3**
150WSW	Plateau	15.40	14.38	**16.25**	>15.45	>14.20	**>16.25**	3	3	**3**	2.76	0.7	**2.40**	I, II, III	I, III	**II, III**	ST_III	ST_I_ON_III	**ST_II_ON_III**	4 to 3	>4	**>4**	9	6	**7**	1.1	0.5	**1.2**
150W	Plateau	14.14	14.47	**15.17**	>14.12	>14.26	**>15.17**	3	3	**3**	1.59	1.01	**3.48**	I, II	I, III	**I, II, III**	ST_II	ST_I_ON_III	**ST_II_ON_III**	>4	>4	**>4**	4	7	**11**	0.7	0.7	**2.4**
150NW	Plateau	14.81	14.52	**12.07**	>14.70	>14.46	**>12.07**	3	3	**3**	NA	1.43	**2.68**	I, II, III	I	**I, II, III**	ST_I_ON_III	ST_I	**ST_II_ON_III**	>4	>4	**>4**	NA	3.5	**8**	1.3	0.7	**2.6**
																						>4						
300N	Plateau	15.79	15.31	**15.33**	>15.72	>15.06	**>15.33**	3	3	**3**	2.25	0.89	**2.86**	I, II	I, III	**II**	ST_II	ST_I_ON_III	**ST_II**	4 to 3	>4	**>4**	6	7	**7**	1.5	1.1	**0.8**
300NE	Plateau	13.54	15.75	**16.37**	>13.48	>15.53	**>16.37**	3	3	**3**	5.00	0.93	**4.11**	II, III	I, II, III	**II, III**	ST_II_ON_III	ST_II_ON_III	**ST_III**	4 to 3	>4	**>4**	11	5	**10**	1.2	1.9	**1.7**
300E	Apron	16.21	11.73	**10.09**	>16.26	>11.62	**0.00**	3	3	**0**	NA	2.73	**4.17**	II	I, II, III	**I, III**	ST_II	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	NA	9	**7**	1.8	1.9	**1.5**
300SE	Apron	11.07	9.96	**11.99**	>11.05	>9.91	**11.99**	3	3	**3**	1.91	1.99	**3.62**	II, III	I, II	**I, II, III**	ST_II_ON_III	ST_II	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	8	5	**9**	1.5	0.8	**1.3**
300S	Apron	12.63	8.66	**9.33**	>12.61	>8.21	**9.33**	3	3	**1**	5.21	3.6	**4.31**	I, II, III	I, II	**I, II, III**	ST_I_ON_III	ST_II	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	9	8	**8**	0.9	1.8	**0.7**
300WSW	Plateau	15.17	14.52	**14.69**	>14.97	>14.45	**>14.69**	3	3	**3**	0.47	2.06	**2.02**	I, II, III	I, II, III	**II, III**	ST_II_ON_III	ST_II_ON_III	**ST_II_ON_III**	>4	>4	**>4**	3	3	**6**	1.1	1.1	**1.3**
300W	Apron	8.90	8.45	**12.72**	0.00	>8.21	**12.72**	0	3	**2**	1.23	1.7	**3.57**	II, III	I, II	**II, III**	ST_II_ON_III	ST_I_TO_II	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	6	4	**9**	0.9	1.6	**1.7**
300NW	Plateau	14.98	14.11	**12.49**	>15.11	>14.10	**>12.49**	3	3	**4**	4.87	1.99	**1.87**	I, II	I, II, III	**I, II, III**	ST_II	ST_I_ON_III	**ST_II_ON_III**	>4	>4	**>4**	7	8.5	**7**	0.8	1.3	**4.0**
450N	Apron	7.74	9.69	**12.35**	>6.08	>9.56	**0.00**	2	3	**0**	3.89	1.92	**3.54**	I, II, III	I, II, III	**II, III**	ST_II_ON_III	ST_II_ON_III	**ST_II_ON_III**	4 to 3	>4	**>4**	9	5	**10**	0.9	1.1	**1.2**
450NE	Apron	5.38	11.99	**10.49**	>4.71	3.76	**0.00**	2	1	**0**	1.96	3.27	**3.74**	I, II	II, III	**II, III**	ST_I_TO_II	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	5	8	**9**	0.9	1.1	**0.8**
450WSW	Plateau	15.19	15.95	**17.45**	>15.08	>15.71	**>17.45**	3	3	**3**	0.82	0.98	**3.40**	II, III	I, II, III	**II, III**	ST_II_ON_III	ST_II_ON_III	**ST_II_ON_III**	>4	>4	**>4**	7	4.5	**8**	1.4	0.9	**1.2**
450NW	Apron	8.59	8.61	**12.39**	0.00	>8.72	**>12.39**	0	3	**3**	3.96	2.61	**2.99**	II, III	I, II, III	**I, II, III**	ST_III	ST_II_ON_III	**ST_II_ON_III**	4 to 3	4 to 3	**>4**	9	8	**9**	0.6	1.4	**1.3**
AVG		13.45	13.16	**14.05**	12.74	12.76	**12.91**	2.72	2.90	**2.72**	2.50	1.72	**3.00**										7.5	6.1	**8.3**	1.08	1.13	**1.54**
MAX		17.02	15.95	**17.45**	>16.85	>15.71	**>17.45**	3	3	**4**	5.21	3.75	**4.35**										11	9	**11**	1.8	2.1	**4.0**
MIN		5.38	8.45	**9.33**	0.00	3.76	**0.00**	0	1	**0**	0.47	0.30	**1.76**										3	3	**6**	0.6	0.4	**0.7**

**** Values shown are means for multiple replicate images obtained and analyzed at each station. If dredged material exceeded the prism penetration depth in at least 66% of the replicates for that station, then the mean value shown is a minimum estimate of dredged material layer thickness (indicated by the >sign).**

4.3 USCGA Mound

The objective of the August 2000 REMOTS sediment profile photography survey was to document the status of benthic recolonization over the USCGA Mound, five years after the development of this mound during the 1994-1995 disposal season. The previous (August 1995) sediment profile photography survey had shown an advanced stage of recolonization relatively soon after the creation of this mound, with the benthic community dominated by Stage II and III taxa (Table 4-3). The average median OSI value of +6.4 calculated in August 1995 suggested only a moderate level of benthic disturbance related to dredged material disposal; this is a relatively high value which reflected the apparent rapid recolonization of the USCGA Mound by advanced successional seres (Stages II and III).

The August 2000 survey showed that the successional status of the benthic community over the USCGA mound continued to be advanced, with Stages II and III continuing to be dominant. Evidence of head-down, deposit-feeding infauna (Stage III) was observed in the photographs at 10 of the 13 stations, and amphipod tube mats (Stage II) were widespread across the surface of the mound. Both larger adult and smaller juvenile amphipod tubes were observed at the sediment surface, with the larger adult tubes appearing to be both active and in various stages of decay. A layer of organic detritus was mixed with the amphipod tubes in many images, suggesting that near-bottom energy levels in and around the USCGA mound were relatively quiescent (depositional) in the weeks leading up to the survey. Larger tubes of the Stage III polychaete *Chaetopterus* sp were visible in several of the images on the USCGA mound, providing further evidence of the advanced recolonization status.

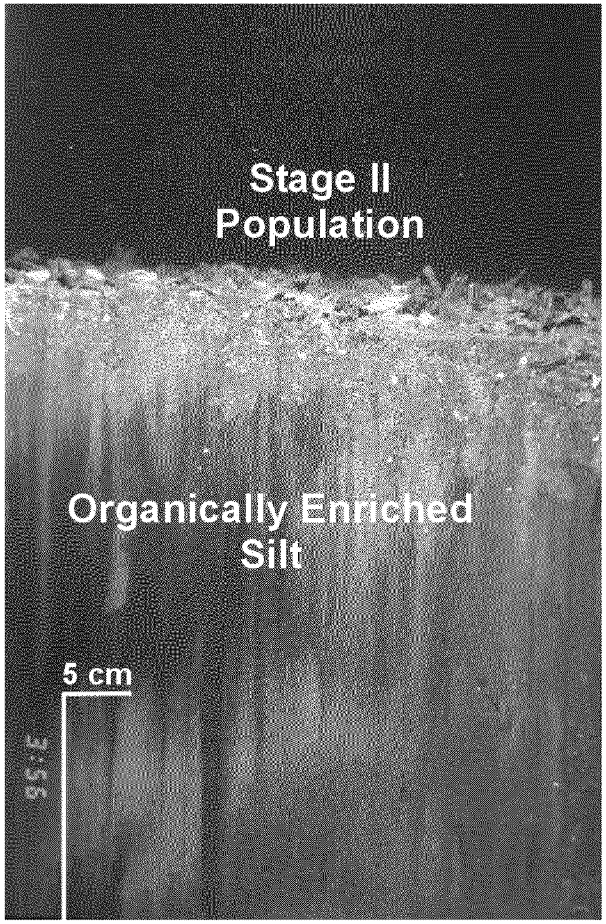
The average RPD depth of 3.8 cm observed at the USCGA Mound in August 2000 was notably deeper than that observed at the reference areas (2.8 cm) or in the previous mound survey of August 1995 (2.7 cm). These deeper RPD depths are attributed to the bioturbation activities of recolonizing Stage III organisms present across this mound since its creation in 1995. The feeding and bioturbation activities of these larger-bodied infauna apparently have acted to increase sediment aeration and decrease sediment levels of both organic carbon and its associated, reduced breakdown products (e.g., sulfides and ammonia). In contrast to the 1995 survey, there was no evidence of low dissolved oxygen (DO) conditions or methane bubbles observed in the sediment profile photographs collected across the USCGA Mound in August 2000. As levels of organic carbon and sulfides have decreased due to consumption by benthic organisms and oxidation, surface sediments at the USCGA Mound generally have become lighter in color (Figure 4-5).

The relatively deep RPD depths and advanced successional status across the USCGA Mound in August 2000 are reflected in relatively high OSI values. The overall average median OSI value of +8.8 is indicative of healthy or undisturbed benthic habitat quality, and was higher than the average value of +6.9 at the NLDS reference areas and the average of +6.4 observed in August 1995. These results suggest that the benthic community and overall benthic habitat quality have recovered completely from the physical disturbance associated with the initial creation of the USCGA Mound in 1995. Benthic habitat quality at this mound in August 2000 was comparable to or better than that existing at the reference areas located on the surrounding ambient seafloor.

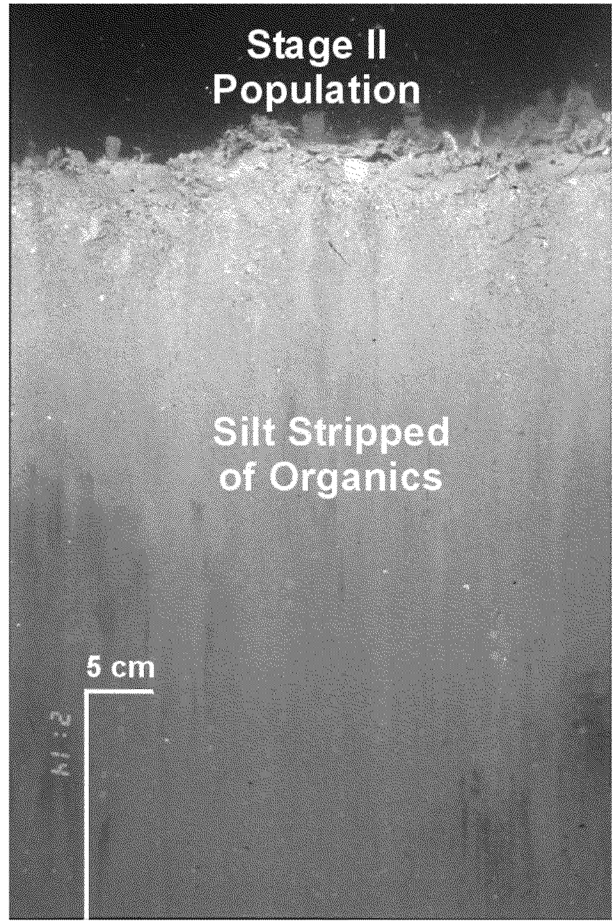
Table 4-3
USCGA REMOTS® Sediment-Profile Photography Results Summary for the 1995 and 2000 Surveys

Station	Camera Penetration Mean (cm)		Dredged Material Thickness Mean (cm)		Number of Reps w/ Dredged Material		RPD Mean (cm)		Successional Stages Present		Highest Stage Present		Grain Size Major Mode (phi)		OSI Median		Boundary Roughness Mean (cm)	
USCGA	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000	1995	2000
CTR	13.58	16.29	>13.59	>16.29	3	3	2.48	4.28	II	II	ST_II	ST_II	>4	>4	3	9	1.2	0.7
50N	14.27	12.94	>14.12	>12.94	3	3	7.64	1.04	II	II, III	ST_II	ST_II_ON_III	>4	>4	9	6	0.8	0.7
50E	14.53	16.16	>14.59	>16.16	3	3	0.82	5.74	II,III	I, II	ST_II_ON_III	ST_II	>4	>4	6	9	1.6	1.1
50SE	13.74	14.24	9.23	>14.24	3	3	2.04	2.97	II	I, II, III	ST_II	ST_I_ON_III	>4	>4	5	8	1.0	1.1
50S	15.90	15.86	>15.66	>15.86	3	3	1.40	4.59	II	I, II, III	ST_II	ST_I_ON_III	>4	>4	6	9	0.8	1.4
50W	15.46	16.37	>15.45	>16.37	3	3	1.88	4.41	II,III	I, II, III	ST_II_ON_III	ST_II_ON_III	>4	>4	7	9	1.4	1.0
100N	13.37	16.70	>13.3	>16.70	3	5	4.97	2.75	II	II	ST_II	ST_II	>4	>4	9	7	1.1	1.5
100E	12.16	14.30	>11.99	>14.30	3	3	1.90	4.51	II,III	I, II, III	ST_II_ON_III	ST_III	>4	>4	8	9	1.0	2.6
100SE	14.74	14.06	13.24	>14.06	3	5	2.42	3.95	II,III	I, II, III	ST_II_ON_III	ST_II_ON_III	>4	>4	6	9	0.8	1.9
100S	12.22	14.18	>11.92	>14.18	3	3	3.92	2.44	II	II, III	ST_II	ST_II_ON_III	4 to 3	>4	8	9	0.6	1.4
100W	14.86	16.11	>14.74	>16.11	3	3	1.31	4.82	II,III	II, III	ST_II_ON_III	ST_II_ON_III	>4	>4	6.5	11	0.8	1.6
150E	14.31	10.37	12.81	>10.37	3	3	2.69	3.63	II	II, III	ST_II	ST_II_ON_III	>4	>4	5	9	1.2	1.7
150S	13.32	16.95	13.01	>16.95	3	4	1.57	4.30	II	II, III	ST_II	ST_II_ON_III	>4	>4	5	11	1.3	1.2
AVG	14.03	14.96	13.35	>14.96	3.00	3.38	2.69	3.80							6.42	8.85	1.0	1.4
MAX	15.90	16.95	>14.86	>16.95	3	5	7.64	5.74							9	11	1.6	2.6
MIN	12.16	10.37	9.23	10.37	3	3	0.82	1.04							3	6	0.6	0.7

** Values shown are means for multiple replicate images obtained and analyzed at each station. If dredged material exceeded the prism penetration depth in at least 66% of the replicates for that station, then the mean value shown is a minimum estimate of dredged material layer thickness (indicated by the >sign).



A



B

Figure 4-5. REMOTS® sediment-profile images obtained at the USCGA Mound Station CTR in (**A**) September 1995 and (**B**) August 2000 displaying changes in appearance after organic material is consumed by benthic infauna or oxidation.

5.0 CONCLUSIONS

A comparison of sequential bathymetric surveys showed a subtle but detectable change in topography at the NL-91 and D/S Mound Complex between September 1997 and August 2000, attributed to the placement of approximately 30,000 m^3 of supplemental CDM since 1997. Accumulations of CDM up to 0.5 m thick were detected in the vicinity of the former D/S and NL-91 buoy locations. Analysis of REMOTS sediment profile images confirmed that a surface depositional layer of recently placed CDM was present over most of the mound complex. Older CDM dating back to 1992 was detected on the eastern arm of the NL-91 and D/S Mound Complex station grid.

There were no detectable changes in topography detected over the Seawolf Mound in August 2000 compared to the previous bathymetric survey of July 1998. Sequential bathymetric survey results obtained at this mound since its creation in 1996 indicate that most of the consolidation of dredged material on the seafloor occurred during the first year following the completion of capping (i.e., between 1996 and 1997).

The REMOTS sediment-profile photographs obtained in August 2000 showed advanced benthic recolonization at all three of the bottom features surveyed (NL-91 and D/S, Seawolf, and USCGA). The benthic community at all three mounds was dominated by a combination of Stage II and Stage III successional seres. Redox depths (RPD values) were consistently deep, indicating good oxygen penetration within the surface sediments. In contrast to previous surveys, there was little evidence of recent physical disturbance of the surface sediments at either NLDS or the reference areas. Intact amphipod tube mats and a depositional layer of organic matter were visible at the sediment surface in the majority of sediment profile photographs, reflecting quiescent (depositional) conditions in the weeks leading up to the August 2000 survey. The amphipods (Stage II) appeared to be in a transition from inactive decaying mats to the reestablishment of active juvenile populations.

The average median OSI value at each of the three mounds in August 2000 (NL-91 and D/S = +8.2, Seawolf = +8.3, and USCGA = +8.8) was greater than the average for the reference areas (+6.9). Both the mound and reference area OSI values are generally considered indicative of healthy or undisturbed benthic habitat quality existing at the time of the August 2000 survey. Overall benthic habitat quality at each of the mounds was comparable to that on the ambient seafloor in August 2000.

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Appendix A
DAMOS Disposal Logs

1998-99 Disposal Season
1999-2000 Disposal Season

Appendix A, Disposal Logs

1997 **1998** **NLDS**

Project: PINE ISLAND BAY

Permit 199000882 **Permitte** SHENNECOSSETT YACHT CLUB

Buoy	Departur	Disposal	Return	Latitude	Longitud	Buoy's	Volume
	9/10/1997	9/10/1997	9/10/1997	41.2705	-72.0751666		300
	10/10/1997	10/10/1997	10/10/1997	41.2706666	-72.0733333		300
	10/10/1997	10/10/1997	10/10/1997	41.2706818	-72.0745361		400
	10/11/1997	10/11/1997	10/11/1997	41.2706318	-72.0747361		400
	10/11/1997	10/11/1997	10/11/1997	41.2706318	-72.0747361		400
	10/12/1997	10/12/1997	10/12/1997	41.2706818	-72.0745361		200
	10/13/1997	10/13/1997	10/13/1997	41.2704485	-72.0746028		200
	10/13/1997	10/13/1997	10/13/1997	41.2706818	-72.0745361		250
	10/13/1997	10/13/1997	10/13/1997	41.2704485	-72.0746028		300
	10/14/1997	10/14/1997	10/14/1997	41.2706818	-72.0745361		350
	10/14/1997	10/14/1997	10/15/1997	41.2704485	-72.0746028		100
	4/4/1998	4/4/1998	4/4/1998	41.2705985	-72.0749361		200
	4/5/1998	4/5/1998	4/5/1998	41.2706318	-72.0747361		300
	4/6/1998	4/6/1998	4/6/1998	41.270449	-72.074603		100
	4/7/1998	4/7/1998	4/7/1998	41.2706318	-72.0747361		200
	4/7/1998	4/7/1998	4/7/1998	41.270682	-72.074536		200
	4/8/1998	4/8/1998	4/8/1998	41.2706818	-72.0745361		150
	4/8/1998	4/8/1998	4/8/1998	41.2704485	-72.0746028		150
	4/9/1998	4/9/1998	4/9/1998	41.2706318	-72.0747361		200
				Project Total Volume:		**3,594 CM**	**4,700 CY**

Project: GALES FERRY MARINA ENTERANCE

Permit 199602834 **Permitte** GALES FERRY MARINA

Buoy	Departur	Disposal	Return	Latitude	Longitud	Buoy's	Volume
	10/14/1997	10/15/1997	10/15/1997	41.2706818	-72.0745361		700
	10/16/1997	10/16/1997	10/16/1997	41.2706818	-72.0745361		800
	10/16/1997	10/17/1997	10/17/1997	41.2706318	-72.0747361		700
	10/17/1997	10/17/1997	10/17/1997	41.2708652	-72.0746695		650
	10/18/1997	10/18/1997	10/18/1997	41.2707152	-72.0743361		600
	10/18/1997	10/18/1997	10/18/1997	41.2707152	-72.0743361		600
				Project Total Volume:		**3,097 CM**	**4,050 CY**
				Buoy Total Volume:		**6,690 CM**	**8,750 CY**

1998 **1999** **NLDS**

Project: MIDDLE COVE CHANNEL

Permit 199400271 **Permitte** MIDDLE COVE MARINA

Buoy	Departur	Disposal	Return	Latitude	Longitud	Buoy's	Volume
	3/13/1999	3/13/1999	3/13/1999	41.2705652	-72.0751195		350
	3/17/1999	3/17/1999	3/17/1999	41.2705652	-72.0749195		700
	3/18/1999	3/18/1999	3/18/1999	41.2710985	-72.0747361		1000
	3/19/1999	3/20/1999	3/20/1999	41.2697485	-72.0755528		1000
	3/30/1999	3/30/1999	3/30/1999	41.2699152	-72.0759362		900
	3/31/1999	3/31/1999	3/31/1999	41.2702652	-72.0753028		1000
	4/1/1999	4/1/1999	4/1/1999	41.2704485	-72.0751028		1000
	4/2/1999	4/2/1999	4/2/1999	41.2704152	-72.0754361		950
	4/6/1999	4/6/1999	4/6/1999	41.2704152	-72.0754361		500

Project Total Volume: **5,658 CM** **7,400 CY**

Project: MIDDLE COVE CHANNEL

Permit 199501661 **Permitte** MIDDLE COVE MARINA

Buoy	Departur	Disposal	Return	Latitude	Longitud	Buoy's	Volume
	1/5/1999	1/5/1999	1/5/1999	41.27085	-72.075		900
	1/10/1999	1/10/1999	1/10/1999	41.2701818	-72.0758362		950
	1/20/1999	1/20/1999	1/20/1999	41.2698485	-72.0744195		1000
	1/26/1999	1/26/1999	1/26/1999	41.2691818	-72.0747195		1000
	2/3/1999	2/3/1999	2/3/1999	41.2688152	-72.0757028		1000
	2/8/1999	2/8/1999	2/8/1999	41.2685652	-72.0748194		1000
	2/11/1999	2/12/1999	2/12/1999	41.2698818	-72.0745361		1000
	2/19/1999	2/19/1999	2/19/1999	41.2691652	-72.0750528		1000
	2/22/1999	2/22/1999	2/22/1999	41.2689485	-72.0749361		800
	2/23/1999	2/23/1999	2/24/1999	41.2690985	-72.0746361		800
	2/28/1999	2/28/1999	2/28/1999	41.2707152	-72.0748028		850
	3/2/1999	3/2/1999	3/2/1999	41.2700152	-72.0741694		1000
	3/5/1999	3/5/1999	3/5/1999	41.2701485	-72.0755361		1000
	3/8/1999	3/8/1999	3/9/1999	41.2705652	-72.0746695		1000
	3/10/1999	3/10/1999	3/10/1999	41.2703818	-72.0753195		950
	3/11/1999	3/11/1999	3/12/1999	41.26555	-72.079467		950
	3/13/1999	3/13/1999	3/13/1999	41.2705652	-72.0751195		650

Project Total Volume: **12,119 CM** **15,850 CY**

Project: GALES FERRY MARINA ENTERANCE

Permit 199602834 **Permitte** GALES FERRY MARINA

Buoy	Departur	Disposal	Return	Latitude	Longitud	Buoy's	Volume
	10/1/1998	10/1/1998	10/1/1998	41.2707152	-72.0743361		650
	10/2/1998	10/2/1998	10/2/1998	41.2706818	-72.0745361		650
	10/5/1998	10/5/1998	10/6/1998	41.2702152	-72.0746695		300

Project Total Volume: **1,223 CM** **1,600 CY**

Project: BREWERS DAUNTLESS SHIPYARD
Permit 199801111 **Permitte** BREWERS DAUNTLESS SHIPYARD

Buoy	Departur	Disposal	Return	Latitude	Longitud	Buoy's	Volume
	12/3/1998	12/4/1998	12/4/1998	41.2692152	-72.0746028	0	600
	12/8/1998	12/8/1998	12/8/1998	41.2711652	-72.0728194		500
	12/9/1998	12/9/1998	12/9/1998	41.2708818	-72.0730861		600
	12/10/1998	12/10/1998	12/11/1998	41.2716318	-72.0726861		600
	12/11/1998	12/11/1998	12/12/1998	41.2711152	-72.0730194		600
	12/12/1998	12/12/1998	12/13/1998	41.2713485	-72.0729528		600
	12/14/1998	12/14/1998	12/14/1998	41.2711152	-72.0730194		700

Project Total Volume: **3,211 CM** **4,200 CY**
Buoy Total Volume: **22,212 CM** **29,050 CY**

1999 **2000** **NLDS**

Project: Pine Island Bay
Permit 199801872 **Permitte** SHENNECOSSETT YACHT CLUB

Buoy	Departur	Disposal	Return	Latitude	Longitud	Buoy's	Volume
	5/16/2000	5/16/2000	5/16/2000	41.26967	-72.07333	NA NA	450
	5/17/2000	5/17/2000	5/17/2000	41.26967	-72.074	NA NA	450
	5/18/2000	5/18/2000	5/18/2000	41.26967	-72.07383	NA NA	450
	5/19/2000	5/19/2000	5/19/2000	41.26967	-72.07383	NA NA	450

Project Total Volume: **1,376 CM** **1,800 CY**
Buoy Total Volume: **1,376 CM** **1,800 CY**
Report Total Volume: **30,278 CM** **39,600 CY**

Appendix B
REMOTS Sediment Profile Imaging Results

NL-91 and D/S Mound Complex
Seawolf Disposal Mound
USCGA Disposal Mound
NLDS Reference Areas

Appendix B1

Station	Replicate	Date	Time	Successional Stage	Grain Size (phi)		Min	Mud Clasts		Camera Penetration (cm)				Dredged Material Thickness (cm)			Redox Rebound Thickness			Apparent RPD Thickness (cm)			Methane	OSI	Surface Roughness	Low DO	Comments		
						Max	Maj Mode	Count	Avg. Diam.	Min	Max	Range	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean							
NL-91 and D/S																													
CTR	A	8/10/2000	20:34	ST_I_TO_II	3	>4	>4	0	0	16.21	17.14	0.93	16.68	16.21	17.14	16.68	0	0	0	0.55	6.43	4.54	0	8	PHYSICAL	NO	NOADDM	0	NEW CDM>P; SANDY M>P; SOME JUVENILE AMPELISCA & DECAYED ADULTS
CTR	B	8/10/2000	20:34	ST_II	2	>4	>4	0	0	15.93	16.92	0.99	16.43	15.93	16.92	16.43	0	0	0	5.11	9.18	7.76	0	9	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; AMPELISCA; V DEEP RPD
CTR	C	8/10/2000	20:35	ST_II_ON_III	2	>4	>4	0	0	13.79	15.22	1.43	14.51	13.79	15.22	14.51	0	0	0	0.05	4.84	2.46	0	9	PHYSICAL	NO	NOADDM	0	NEW CDM>P; SANDY M>P; SM ROCK; 1 AMPELISCA; VOIDS; BURROWS
100N	A	8/10/2000	21:32	ST_II	2	>4	>4	0	0	7.98	9.29	1.31	8.63	7.98	9.29	8.63	0	0	0	1.8	7.21	4.27	0	9	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY MUD; DECAYING AMP MAT; ALIVE ADULT AMPELISCA IN FARFIELD
100N	B	8/10/2000	21:33	ST_II	2	>4	>4	0	0	15.52	16.01	0.49	15.77	15.52	16.01	15.77	0	0	0	1.61	3.6	2.51	0	7	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY MUD; DECAYING AMP MAT; AMPHIPOD STALK
100N	C	8/10/2000	21:34	ST_II	2	>4	>4	0	0	12.79	13.55	0.77	13.17	12.79	13.55	13.17	0	0	0	0.05	5.79	2.75	0	7	BIOGENIC	NO	New CDM	7.27	NEW CDM/OLD SANDY CDM; PARTLY DECAYED ADULT AMP MAT; SNAIL
100N	D	8/12/2000	13:34	ST_II	2	>4	>4	0	0	16.12	16.39	0.27	16.26	16.12	16.39	16.26	0	0	0	1.26	4.81	3.01	0	8	BIOGENIC	NO	New CDM	9.55	NEW CDM/OLD CDM; SANDY MUD; JUVENILE AMP MAT
100E	A	8/10/2000	20:40	ST_II	2	>4	>4	0	0	15.55	15.88	0.33	15.71	15.55	15.88	15.71	0	0	0	0.22	5.44	3.24	0	8	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; MANY AMPELISCA
100E	B	8/10/2000	20:41	ST_II_ON_III	2	>4	>4	0	0	13.35	14.84	1.48	14.09	13.35	14.84	14.09	0	0	0	0.99	3.63	2.38	0	9	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; 1 AMPELISCA; MANY TUBES; VOID
100E	D	8/12/2000	13:12	ST_II	2	>4	>4	0	0	14.29	14.67	0.38	14.48	14.29	14.67	14.48	0	0	0	1.87	5.44	3.6	0	8	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; AMPELISCA
100S	A	8/10/2000	21:26	ST_I_TO_II	2	>4	>4	0	0	13.28	13.61	0.33	13.44	13.28	13.61	13.44	0	0	0	0.81	4.25	3.26	0	7	PHYSICAL	NO	NOADDM	0	NEW CDM>P; NEW CDM SANDY MUD; BURROW OPENING; AMPHIPOD STALKS; SHELL
100S	B	8/10/2000	21:27	ST_II_ON_III	2	>4	>4	0	0	11.37	11.8	0.44	11.58	11.37	11.8	11.58	0	0	0	0.27	4.14	2.73	0	9	BIOGENIC	NO	NOADDM	0	NEW CDM>P; JUVENILE AMP TUBES; VOIDS; SHELL PIECES
100S	C	8/10/2000	21:28	ST_II_ON_III	2	>4	>4	0	0	10.11	11.48	1.37	10.79	10.11	11.48	10.79	0	0	0	0.27	4.04	2.12	0	8	BIOGENIC	NO	NOADDM	0	NEW CDM>P; NEW CDM V FINE SAND; VOIDS; JUV AMP MAT; POLY TUBES
100W	A	8/10/2000	20:17	ST_II_ON_III	2	>4	>4	0	0	13.24	13.46	0.22	13.35	13.24	13.46	13.35	0	0	0	1.92	7.91	5.15	0	11	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; MANY SURF TUBES; AMPELISCA; VOID; LG BURROW
100W	B	8/10/2000	20:18	ST_II_ON_III	2	>4	>4	0	0	9.23	10.38	1.15	9.81	9.23	10.38	9.81	0	0	0	0.38	6.26	3.59	0	10	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; AMPELISCA; VOID; BURROW; ALIVE & DECAYED AMPS
100W	C	8/10/2000	20:19	ST_II	2	>4	>4	0	0	8.41	10.49	2.09	9.45	8.41	10.49	9.45	0	0	0	1.15	3.68	2.5	0	7	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; LIVE&DECAYED AMPELISCA; BURROW OPENING; FINE SHELL BITS@Z
200N	A	8/12/2000	13:41	ST_I	2	>4	4 to 3	0	0	4.64	10.33	5.68	7.49	4.64	10.33	7.49	0	0	0	0.05	5.85	3.23	0	6	BIOGENIC	NO	NOADDM	0	NEW CDM>P; TUNICATE; BRYOZOANS
200N	B	8/12/2000	13:41	ST_II	2	>4	>4	0	0	13.01	13.83	0.82	13.42	13.01	13.83	13.42	0	0	0	0.87	6.07	3.08	0	8	BIOGENIC	NO	NOADDM	0	NEW CDM>P; DECAYING AMP MAT; SHELL BITS @ Z
200N	C	8/12/2000	13:42	ST_II_ON_III	2	>4	>4	0	0	10.6	12.24	1.64	11.42	10.6	12.24	11.42	0	0	0	0.81	6.08	3.68	0	10	BIOGENIC	NO	NOADDM	0	NEW CDM>P; PARTLY DECAYED AMP MAT W/ACTIVE AMPS; BURROW/VOID; ORG DETRITUS
200E	A	8/10/2000	20:46	ST_II	2	>4	>4	0	0	13.63	13.85	0.22	13.74	13.63	13.85	13.74	0	0	0	2.1	6.83	5.09	0	9	BIOGENIC	NO	NOADDM	0	NEW? CDM>P; SANDY M>P; AMPELISCA; TUBES; SHELL BITS
200E	B	8/10/2000	20:47	ST_I_TO_II	2	>4	>4	6	0.34	7.64	7.86	0.22	7.75	7.64	7.86	7.75	0	0	0	0.82	4.45	2.7	0	6	BIOGENIC	NO	NOADDM	0	NEW OR OLD CDM>P; SANDY M>P; SHELL; OX CLASTS; TUBES; ORG DETRITUS
200E	C	8/10/2000	20:48	ST_II	2	>4	>4	0	0	13.93	14.43	0.49	14.18	13.93	14.43	14.18	0	0	0	0.38	4.48	2.91	0	7	BIOGENIC	NO	NOADDM	0	NEW OR OLD CDM>P; AMPELISCA TUBES; DECAYING AMP MAT; SANDY MUD
200E	D	8/12/2000	13:28	ST_II_ON_III	2	>4	>4	0	0	12.4	14.26	1.86	13.33	12.4	14.26	13.33	0	0	0	2.62	6.34	4.33	0	11	BIOGENIC	NO	NOADDM	0	NEW OR OLD CDM; SANDY MUD; DECAYING AMP MAT; VOID; ORG DETRITUS
200S	A	8/10/2000	21:17	ST_II	2	>4	>4	0	0	12.02	12.62	0.6	12.32	12.02	12.62	12.32	0	0	0	1.91	7.87	3.74	0	8	BIOGENIC	NO	NOADDM	0	OLD CDM OR AMBIENT SANDY MUD>P; ADULT APMELISCA & DECAYING AMP MAT; WIPER CLASTS/SMEARS
200S	B	8/10/2000	21:18	ST_II_ON_III	2	>4	>4	0	0	10.93	13.39	2.46	12.16	10.93	13.39	12.16	0	0	0	2.04	6.29	4.61	0	11	BIOGENIC	NO	NOADDM	0	OLD CDM OR AMBIENT SANDY MUD>P; VOIDS; BURROW; AMPHIPOD STALKS?
200S	C	8/10/2000	21:19	ST_I_TO_II	2	>4	>4	0	0	10.87	13.17	2.3	12.02	10.87	13.17	12.02	0	0	0	2.3	7.87	4.67	0	8	BIOGENIC	NO	NOADDM	0	OLD CDM OR AMBIENT SANDY MUD>P; AMPHIPOD TUBE STALKS; BURROW OPENING; SHELL PIECE
200W	A	8/10/2000	19:58	ST_III	1	>4	>4	0	0	11.04	11.98	0.93	11.51	11.04	11.98	11.51	0	0	0	1.65	4.12	2.97	0	9	INDET	NO	NOADDM	0	NEW CDM>P; SANDY M/M; BURROWS; VOID; FLUID SURF LAYER; SHELL HASH
200W	B	8/10/2000	19:59	ST_I	2	>4	>4	0	0	11.48	12.25	0.77	11.87	11.48	12.25	11.87	0	0	0	0.05	5.71	3.21	0	6	PHYSICAL	NO	NOADDM	0	NEW CDM>P; S/SANDY M; PEBBLES; SHELL BITS
200W	C	8/10/2000	20:12	ST_I_ON_III	2	>4	>4	0	0	14.07	14.78	0.71	14.42	14.07	14.78	14.42	0	0	0	2.64	6.98	4.68	0	11	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY M>P; MANY SURF TUBES; VOIDS; SHELL BITS
300N	B	8/12/2000	13:47	ST_II_ON_III	2	>4	>4	0	0	14.64	15.96	1.31	15.3	14.64	15.96	15.3	0	0	0	0.54	4.41	2.75	0	9	BIOGENIC	NO	NOADDM	0	NEW CDM>P; SANDY MUD; AMP MAT; VOID; BURROWS; SHELL BITS
300N	C	8/12/2000	13:47	ST_II	3	>4	>4	0	0	16.99	19.56	2.57	18.28	16.99	19.56	18.28	0	0	0	0.22	3.49	2.9	0	7	BIOGENIC	NO	NOADDM	0	NEW CDM>P; CONSOLIDATEDCLAY; DISTD AMP MAT
300E	A	8/10/2000	20:55	ST_II	2	>4	>4	0	0	14.7	16.17	1.48	15.44	14.7	16.17	15.44	0	0	0	0.05	3.99	1.36	0	5	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; ADULT AMPELISCA; SHALLOW RPD
300E	B	8/10/2000	20:56	ST_I_ON_III	2	>4	>4	0	0	10.38	11.69	1.31	11.04	10.38	11.69	11.04	0	0	0	0.27	2.62	1.31	0	7	PHYSICAL	NO	NOADDM	0	OLD CDM>P;SANDY MUD;AMP TUBES;VOIDS; BURROWS; SHELLS/PIECES; V THIN RPD
300E	C	8/10/2000	20:57	ST_I_TO_II	2	>4	>4	0	0	13.99	16.07	2.08	15.03	13.99	16.07	15.03	0	0	0	0.27	4.75	2.82	0	6	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; DECAYING AMP TUBES; AMPELISCA; SHELL BITS
400E	A	8/10/2000	21:01	ST_II	2	>4	>4	0	0	10.38	11.37	0.98	10.87	10.38	11.37	10.87	0	0	0	2.3	7.54	5.11	0	9	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; DECAYING AMP MAT; ORG DETRITUS
400E	B	8/10/2000	21:02	ST_I_ON_III	2	>4	>4	0	0	19.02	19.45	0.44	19.23	19.02	19.45	19.23	0	0	0	4.26	8.2	6.3	0	11	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; DISTURBED AMP MAT; VOIDS; LG BURROW
400E	C	8/10/2000	21:03	ST_II_ON_III	2	>4	>4	0	0	14.7	16.5	1.8	15.6	14.7	16.5	15.6	0	0	0	0.98	4.43	2.55	0	9	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; DISTD AMP MAT; AMPELISCA TUBES; VOID; SHELL BITS
500E	A	8/10/2000	21:08	ST_I	2	>4	>4	0	0	14.48	14.75	0.27	14.62	14.48	14.75	14.62	0	0	0	1.15	4.48	2.86	0	5	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; DECAYING AMP MAT; RETROGRADE SUCCESSION
500E	B	8/10/2000	21:09	ST_I_ON_III	2	>4	>4	0	0	12.68	13.5	0.82	13.09	12.68	13.5	13.09	0	0	0	0.98	3.5	2.26	0	9	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; DECAYING AMP MAT&ORG DETRITUS; VOID; SHELL PIECE @ Z
500E	C	8/10/2000	21:09	ST_II	2	>4	>4	0	0	15.08	15.57	0.49	15.33	15.08	15.57	15.33	0	0	0	0.11	4.75	3.33	0	8	BIOGENIC	NO	NOADDM	0	OLD CDM>P; SANDY MUD; DISTD AMP MAT; SHELL PIECE; WIPER CLASTS

Appendix B2

Station	Replicate	Date	Time	Successional Stage	Grain Size (phi) Max	Maj Mode	Min	Mud Clasts Count	Mud Clasts Avg. Diam.	Camera Penetration (cm) Min	Camera Penetration Max	Camera Penetration Range	Camera Penetration Mean	Dredged Material Thickness (cm) Min	Dredged Material Max	Dredged Material Mean	Redox Rebound Thickness Min	Redox Rebound Max	Redox Rebound Mean	Apparent RPD Thickness (cm) Min	Apparent RPD Max	Apparent RPD Mean	Methane	OSI	Surface Roughness	Low DO	Comments
Seawolf																											
CTR	A	8/12/2000	18:10	ST_I	>4	2	>4	0	0	14.75	16.94	2.19	15.85	14.75	16.94	15.85	0	0	0	0.55	4.75	2.98	0	5	PHYSICAL	NO	DM>P; SAND/PATCHY GREY CLAY; SHELL BITS IN SAND LAYER; ORG DETRITUS
CTR	B	8/12/2000	18:11	ST_II	>4	3	>4	0	0	13.66	15.68	2.02	14.67	13.66	15.68	14.67	0	0	0	0.05	3.39	1.4	0	5	PHYSICAL	NO	DM>P; GREY CLAY; CREPIDULA SHELL; DECAYING AMPS;SM SHELL BITS SURF SEDS
CTR	C	8/12/2000	18:12	ST_I_ON_III	>4	3	>4	0	0	15.52	15.85	0.33	15.68	15.52	15.85	15.68	0	0	0	0.66	5.3	2.94	0	9	PHYSICAL	NO	DM>P; SANDY/GREY CLAY; SHELL LAG; BURROW/OPENING; VOID
75N	A	8/12/2000	19:09	ST_II	>4	2	>4	0	0	11.64	12.79	1.15	12.21	11.64	12.79	12.21	0	0	0	2.4	7.76	5.41	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE AMPS; SHELL FINES IN SUBSURF SEDS; SHELLS & BITS
75N	B	8/12/2000	19:10	ST_II	>4	2	>4	0	0	9.07	13.22	4.15	11.15	9.07	13.22	11.15	0	0	0	0.49	4.21	2.24	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; SHELL LAG; 1 JUVENILE AMP
75N	C	8/12/2000	19:11	ST_II_ON_III	>4	2	>4	0	0	10.66	12.84	2.19	11.75	10.66	12.84	11.75	0	0	0	0.05	2.62	1.32	0	7	BIOGENIC	NO	DM>P; SANDY/PATCHY GREY CLAY; DECAYED AMPS; VOID; SHELL PIECE; ROCK
75N	D	8/13/2000	13:06	ST_II	>4	3	>4	0	0	11.91	13.28	1.37	12.6	11.91	13.28	12.6	0	0	0	0.44	5.41	2.71	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ACTIVE & DECAYING AMPS; SHELL BITS @ Z
75NE	A	8/12/2000	20:02	ST_II	>4	3	>4	0	0	4.97	12.62	7.65	8.8	4.97	12.62	8.8	0	0	0	0.55	6.23	3.06	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DISTD SURF; ORG DETRITUS; BURROW OPENING?
75NE	B	8/12/2000	20:03	ST_II	>4	3	>4	0	0	15.46	16.56	1.09	16.01	15.46	16.56	16.01	0	0	0	1.09	4.04	2.26	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE & ADULT AMPS; BURROW
75NE	C	8/12/2000	20:04	ST_II	>4	3	>4	0	0	17.49	18.91	1.42	18.2	17.49	18.91	18.2	0	0	0	0.77	3.01	1.68	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYED AMPS
75E	A	8/12/2000	21:03	ST_II	>4	3	>4	0	0	11.78	13.08	1.3	12.43	11.78	13.08	12.43	0	0	0	1.68	6.43	3.66	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYING AMPS & ORG DETRITUS
75E	B	8/12/2000	21:03	ST_II_ON_III	>4	3	>4	0	0	18.43	19.35	0.92	18.89	18.43	19.35	18.89	0	0	0	2.38	10.54	6.57	0	11	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ACTIVE & DECAYING AMPS; VOID; BURROW; SHELL FINES @ Z
75E	C	8/12/2000	21:04	ST_II_ON_III	>4	3	>4	0	0	16.05	16.59	0.54	16.32	16.05	16.59	16.32	0	0	0	2.22	3.95	2.82	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYED AMPS; VOID/BURROW
75SE	A	8/12/2000	18:16	ST_II	>4	3	>4	0	0	13.77	16.61	2.84	15.19	13.77	16.61	15.19	0	0	0	0.11	4.54	1.67	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYING AMP MAT; ADULT & JUVENILE AMPS; SHELL PIECE
75SE	B	8/12/2000	18:17	INDET	>4	3	>4	0	0	13.72	14.92	1.2	14.32	13.72	14.92	14.32	0	0	0	NA	NA	NA	0	99	INDET	NO	DM>P; FLUID CLAST LAYER; GREY CLAY; ORG DETRITUS & DECAYED AMPS
75SE	C	8/12/2000	18:19	ST_II	>4	3	>4	0	0	16.28	17.27	0.98	16.78	16.28	17.27	16.78	0	0	0	0.75	5.91	2.46	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; WORMS @ Z; DECAYING AMP TUBES; AMPELISCA
75S	A	8/12/2000	19:04	ST_II_ON_III	>4	3	>4	0	0	11.26	13.99	2.73	12.62	11.26	13.99	12.62	0	0	0	0.05	0.93	0.65	0	6	BIOGENIC	NO	DM>P; GREY CLAY; BURROW OPENING; VOID; AMPELISCA; JUVENILE & ADULT AMPS; SHELLS
75S	B	8/12/2000	19:05	ST_II	>4	2	>4	0	0	14.48	15.3	0.82	14.89	14.48	15.3	14.89	0	0	0	1.86	5.08	3.4	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE & ADULT AMPS; SOME FLUID LAYER
75S	C	8/12/2000	19:05	ST_II_ON_III	>4	3	>4	0	0	14.75	16.5	1.75	15.63	14.75	16.5	15.63	0	0	0	2.19	4.81	3.87	0	11	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ADULT & DECAYING AMPS; VOID; ORG DETRITUS; SHELL
75WSW	A	8/12/2000	20:09	ST_II	>4	3	>4	0	0	17.43	19.23	1.8	18.33	17.43	19.23	18.33	0	0	0	0.6	4.26	1.71	0	6	PHYSICAL	NO	DM>P; SANDY/GREY CLAY; WORM @ Z; JUVENILE AMPS
75WSW	B	8/12/2000	20:09	ST_II_ON_III	>4	3	>4	0	0	13.77	15.03	1.26	14.4	13.77	15.03	14.4	0	0	0	1.53	5.36	3.37	0	10	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; VOIDS; ACTIVE & DECAYING AMPS; WORMS @ Z
75WSW	C	8/12/2000	20:10	ST_II	>4	3	>4	0	0	16.34	16.72	0.38	16.53	16.34	16.72	16.53	0	0	0	1.04	3.61	1.78	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; BURROW/OPENING; JUVENILE & ADULT AMPS
75W	D	8/13/2000	13:11	ST_II	>4	3	>4	0	0	16.43	17.14	0.7	16.78	16.43	17.14	16.78	0	0	0	0.7	3.62	2	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE & ADULT AMPS; SHELL BITS IN SUBSURF
75W	E	8/13/2000	13:12	ST_II	>4	3	>4	0	0	15.57	17.03	1.46	16.3	15.57	17.03	16.3	0	0	0	0.92	4.76	2.96	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYED AMPS; BURROW/OPENING
75W	F	8/13/2000	13:13	ST_I	>4	3	>4	0	0	12.76	13.62	0.86	13.19	12.76	13.62	13.19	0	0	0	0.05	1.3	0.67	0	2	PHYSICAL	NO	DM>P; GREY CLAY; WORM @ Z; SHELL BITS; STG 1 TUBES?; THIN RPD
75W	G	8/13/2000	13:14	ST_II_ON_III	>4	3	>4	0	0	12.92	13.35	0.43	13.14	12.92	13.35	13.14	0	0	0	0.11	2	1.41	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE AMPS; VOIDS; SM SHELL BITS
75NW	A	8/12/2000	18:02	ST_II	>4	3	>4	0	0	15.96	16.83	0.87	16.39	15.96	16.83	16.39	0	0	0	0.33	5.68	3.21	0	8	BIOGENIC	NO	DM>P; GREY CLAY; ADLT AMP TUBES&POLY TUBES; SHELL BITS SUBSRF;OBSC RPD
75NW	B	8/12/2000	18:03	ST_II	>4	3	>4	0	0	16.56	18.47	1.91	17.51	16.56	18.47	17.51	0	0	0	1.53	4.32	2.75	0	7	BIOGENIC	NO	DM>P; GREY CLAY; AMPELISCA; ADULT & JUVENILE AMP TUBES; DECAYED AMPS
75NW	C	8/12/2000	18:05	ST_II	>4	3	>4	0	0	16.56	17.27	0.71	16.91	16.56	17.27	16.91	0	0	0	0.98	4.15	2.24	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; SHELL LAG; DECAYED AMP TUBES; LG BURROW/OPENING; SURF DETRITUS
75NW	D	8/12/2000	18:06	ST_II	>4	3	>4	0	0	14.21	15.57	1.37	14.89	14.21	15.57	14.89	0	0	0	1.8	5.52	3.62	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYING AMPS; ORG DETRITUS
150N	A	8/12/2000	19:15	ST_II_ON_III	>4	2	>4	0	0	14.32	16.01	1.69	15.16	14.32	16.01	15.16	0	0	0	0.98	3.22	2.38	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; VOID; BURROW/OPENING; ADULT AMPS; SHELL FINES@Z
150N	B	8/12/2000	19:15	ST_II	>4	3	>4	0	0	14.43	15.68	1.26	15.05	14.43	15.68	15.05	0	0	0	1.04	3.61	2.38	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE & ADULT AMPS; SHELL V FINES IN SUBSURF SEDS
150N	C	8/12/2000	19:16	ST_II	>4	3	>4	0	0	15.08	16.45	1.37	15.77	15.08	16.45	15.77	0	0	0	0.77	5.41	2.69	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ADULT & JUVENILE AMPS; SHELL BITS IN SUBSURF SEDS, AMPELISCA
150NE	A	8/12/2000	19:46	ST_II	>4	3	>4	0	0	14.04	14.97	0.93	14.51	14.04	14.97	14.51	0	0	0	3.06	7.16	4.88	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYING AMPS & ORG DETRITIS
150NE	B	8/12/2000	19:47	ST_II	>4	3	>4	0	0	13.55	15.46	1.91	14.51	13.55	15.46	14.51	0	0	0	1.18	3.82	2.45	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; SHELL; DECAYING AMPS&ORG DETRITUS; BRYOZOANS; AMPELISCA
150NE	C	8/12/2000	19:48	ST_II_ON_III	>4	3	>4	0	0	16.45	17.21	0.77	16.83	16.45	17.21	16.83	0	0	0	0.05	7.27	2.76	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYING AMPS & ORG DETRITUS; VOID; BURROWS
150E	A	8/12/2000	21:08	INDET	>4	3	>4	0	0	16.05	16.97	0.92	16.51	16.05	16.97	16.51	0	0	0	NA	NA	NA	0	99	INDET	NO	DM>P; FLUID CLAST LAYER; SHELL BITS IN SUBSURF SEDS
150E	B	8/12/2000	21:09	ST_II	>4	3	>4	0	0	16.59	19.62	3.03	18.11	16.59	19.62	18.11	0	0	0	1.57	4.11	2.3	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE & ADULT AMPS; SHELL BITS & FINES IN SUBSURF SEDS
150E	C	8/12/2000	21:10	ST_II	>4	3	>4	0	0	13.89	14.97	1.08	14.43	13.89	14.97	14.43	0	0	0	0.05	1.62	0.93	0	5	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE AMPS; SHELL BITS & FINES IN SUBSURF; BURROW/OPENING
150E	D	8/13/2000	12:44	ST_II	>4	3	>4	0	0	10.22	10.32	0.11	10.27	10.22	10.32	10.27	0	0	0	2.16	5.57	4.24	0	9	BIOGENIC	NO	DM>P; SANDY MUD; ADULT AMPS; AMPELISCA; SHELL FINES IN SUBSURF
150SE	A	8/12/2000	18:23	ST_II_ON_III	>4	3	>4	0	0	13.88	14.75	0.87	14.32	13.88	14.75	14.32	0	0	0	2.51	4.97	3.24	0	10	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ACTIVE & DECAYING AMP MAT; VOID; BURROW; FEW SHELL BITS
150SE	B	8/12/2000	18:24	ST_II	>4	2	>4	0	0	13.55	15.36	1.8	14.45	13.55	15.36	14.45	0	0	0	1.64	5.25	3.16	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYING AMP MAT & ORG DETRITUS; FEW SHELL BITS
150SE	C	8/12/2000	18:25	ST_II	>4	3	>4	0	0	14.37	15.36	0.98	14.86	14.37	15.36	14.86	0	0	0	0.22	1.97	1.34	0	5	BIOGENIC	NO	DM>P; SLIGHT SANDY/GREY CLAY; DECAYED AMP MAT
150S	A	8/12/2000	18:58	ST_II_ON_III	>4	2	>4	0	0	13.22	14.64	1.42	13.93	13.22	14.64	13.93	0	0	0	2.3	3.5	2.79	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; VOID; JUVENILE & ADULT AMPS; SHELL BIT
150S	B	8/12/2000	18:59	ST_II	>4	2	>4	0	0	11.48	12.9	1.42	12.19	11.48	12.9	12.19	0	0	0	0.66	7.38	4.49	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; WIPER CLAST/SMEAR; JUVENILE AMPS
150S	C	8/12/2000	19:00	ST_I_ON_III	>4	2	>4	0	0	12.73	13.77	1.04	13.25	12.73	13.77	13.25	0	0	0	1.04	4.92	3.54	0	10	PHYSICAL	NO	DM>P; SANDY/GREY CLAY; VOIDS; BURROWS; ROCKS; AMPHI STALKS; SEASTAR ARM
150WSW	A	8/12/2000	20:13	ST_II_ON_III	>4	2	>4	0	0	14.26	15.25	0.98	14.75	14.26	15.25	14.75	0	0	0	1.31	3.06	2.46	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; CHAETOPTERUS; VOID/BURROW; ADULT & DECAYING AMPS
150WSW	B	8/12/2000	20:14	ST_II	>4	3	>4	0	0	15.68	16.89	1.2	16.28	15.68	16.89	16.28	0	0	0	0.87	3.83	2.69	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUVENILE & ADULT AMPS
150WSW	C	8/12/2000	20:15	ST_II	>4	3	>4	0	0	17.1	18.36	1.26	17.73	17.1	18.36	17.73	0	0	0	1.2	2.95	2.06	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DISTURBED AMPS?
150W	A	8/12/2000	20:46	ST_II_ON_III	>4	2	>4	0	0	11.68	15.41	3.73	13.54	11.68	15.41	13.54	0	0	0	1.03	7.78	3.93	0	11	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; VOIDS; DECAYING AMPS
150W	B	8/12/2000	20:47	ST_II_ON_III	>4	3	>4	0	0	17.08	19.03	1.95	18.05	17.08	19.03	18.05	0	0	0	2.96	7.26	5.53	0	11	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; VOID; DECAYING AMPS&ORG DETRITUS; SHELL PIECES; SHELL BITS IN SUBSURF SEDS
150W	C	8/12/2000	20:48	ST_I_TO_II	>4	3	>4	0	0	13.14	14.7	1.57	13.92	13.14	14.7	13.92	0	0	0	0.05	1.57	0.99	0	4	PHYSICAL	NO	DM>P; GREY CLAY; STG 1 WORMS; DECAYED AMP; WIPER CLAST/SMEAR
150NW	A	8/12/2000	17:57	ST_II_ON_III	>4	2	>4	0	0	11.26	13.93	2.68	12.6	11.26	13.93	12.6	0	0	0	1.2	3.77	2.65	0	9	BIOGENIC	NO	DM>P; JUVENILE & ADULT AMPS; AMPELISCA; VOID; BURROWS; SHELL BITS IN SUBSURF SEDS
150NW	B	8/12/2000	17:58	ST_II	>4	3	>4	0	0	14.75	16.94	2.19	15.85	14.75	16.94	15.85	0	0	0	0.49	5.57	3.17	0	8	BIOGENIC	NO	DM>P; SANDY MUD; DETRITUS&DECAYING AMP MAT; SHELL; POSS BURROW OPENING
150NW	C	8/12/2000	17:59	ST_I	>4	3	>4	0	0	6.23	9.29	3.06	7.76	6.23	9.29	7.76	0	0	0	0.22	4.03	2.21	0	4	BIOGENIC	NO	DM>P; UNEVEN OR DIST SURF; SHELL PIECES; BURROW/OPENING
300N	A	8/12/2000	19:20	ST_II	>4	2	>4	0	0	15.3	15.85	0.55	15.57	15.3	15.85	15.57	0	0	0	0.05	3.77	2.49	0	7	BIOGENIC	NO	DM/MUD; DECAYING AMPS & ORG DETRITUS; SHELLS & PIECES
300N	B	8/12/2000	19:21	ST_II	>4	2	>4	0	0	11.2	12.73	1.53	11.97	11.2	12.73	11.97	0	0	0	0.27	4.37	3.19	0	8	BIOGENIC	NO	DM/MUD; ACTIVE & DECAYING AMPS&ORG DETRITUS; SHELL FINES@SUBBSURF SEDS
300N	C	8/12/2000	19:21	ST_II	>4	2	>4	0	0	18.25	18.63	0.38	18.44	18.25	18.63	18.44	0	0	0	1.2	6.39	2.89	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; JUV&ADULT AMPS; LG BURROW; SHELL BITS & FINES@Z
300NE	A	8/12/2000	19:37	ST_II	>4	2	>4	0	0	14.97	16.99	2.02	15.98	14.97	16.99	15.98	0	0	0	0.71	8.09	5.04	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ORG DETRITIS; BURROW/OPENING; SHELL BITS/FINES SUBSURF
300NE	C	8/12/2000	19:39	ST_II_ON_III	>4	3	>4	0	0	15.74	17.76	2.02	16.75	15.74	17.76	16.75	0	0	0	1.75	5.41	3.71	0	10	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; VOID; WORM @Z; ADULT/JUVENILE AMPS; DECAYED AMPS
300NE	D	8/12/2000	19:42	ST_II_ON_III	>4	2	>4	0	0	15.9	16.89	0.98	16.39	15.9	16.89	16.39	0	0	0	1.42	7.6	3.58	0	10	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; LG BURROWS; VOIDS; ORG DETRITUS
300E	A	8/13/2000	12:32	ST_I	>4	3	>4	0	0	9.14	9.95	0.81	9.54	9.14	9.95	9.54	0	0	0	2.81	6.86	5.26	0	7	BIOGENIC	NO	AMBIENT SANDY MUD; ORG DETRITUS; SHELL BITS/FINES SUBSURF SEDS
300E	B	8/13/2000	12:33	ST_I	>4	3	>4	0	0	10	11.41	1.41	10.7	10	11.41	10.7	0	0	0	1.89	4.92	3.77	0	7	BIOGENIC	NO	AMBIENT SANDY MUD; ORG DETRITUS; TUBES?
300E	C	8/13/2000	12:34	ST_I	>4	3	>4	0	0	3.03	3.51	0.49	3.27	3.03	3.51	3.27	0	0	0	2.32	3.41	3.04	0	6	BIOGENIC	NO	AMBIENT SANDY MUD; RPD>P; BURROW OPENING?
300E	D	8/13/2000	12:37	ST_III	>4	3	>4	0	0	15.3	18.43	3.14	16.86	15.3	18.43	16.86	0	0	0	2.16	8.05	4.59	0	11	BIOGENIC	NO	AMBIENT SANDY MUD; CHAETOPTERUS; SHELL BITS SUBSURF; DISTD AMPS?; BRYOZOAN
300SE	A	8/12/2000	18:28	ST_II_ON_III	>4	2	>4	0	0	10.98	11.75	0.77	11.37	10.98	11.75	11.37	0	0	0	0.93	4.21	2.56	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; LG BURROWS; VOIDS; ORG DETRITUS; BRYOZOANS; SHELLS OR ROCKS
300SE	B	8/12/2000	18:29	ST_II	>4	3	>4	0	0	13.22	13.88	0.66	13.55	13.22	13.88	13.55	0	0	0	1.86	5.68	4.11	0	9	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ACTIVE & DECAYING AMP MAT; SHELL
300SE	C	8/12/2000	18:30	ST_II_ON_III	>4	3	>4	0	0	10.38	13.61	3.22	11.99	10.38	13.61	11.99	0	0	0	0.43	2.85	1.38	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ADULT & JUVENILE AMPS; VOID; BURROW OPENING; SHELL BIT
300SE	D	8/12/2000	18:33	ST_I	>4	2	>4	0	0	7.98	9.23	1.26	8.61	7.98	9.23	8.61	0	0	0	0.33	4.26	2.72	0	5	PHYSICAL	NO	AMBIENT SANDY MUD/MUD; PEBBLES @ SURF
300SE	E	8/13/2000	12:49	ST_II	>4	2	>4	0	0	14.21	14.7	0.49	14.45	14.21	14.7	14.45	0	0	0	4.86	9.23	7.32	0	9	BIOGENIC	NO	AMBIENT SANDY MUD/MUD; SHELL BITS IN SUBSURF SEDS; JUVENILE AMPS; HYDROID IN FARFIELD
300S	A	8/12/2000	18:52	ST_II_ON_III	>4	2	>4	0	0	14.04	14.26	0.22	14.15	14.04	14.26	14.15	0	0	0	1.86	6.99	4.78	0	11	BIOGENIC	NO	AMBIENT SANDY MUD/MUD; JUVENILE AMPS; VOIDS; BURROW; SHELL FINES @ Z; SHELL BITS
300S	B	8/12/2000	18:53	ST_I	>4	2	>4	0	0	4.21	5.74	1.53	4.97	4.21	5.74	4.97	0	0	0	1.48	5.14	3.93	0	7	BIOGENIC	NO	AMBIENT SANDY MUD; BRYOZOANS; SHELL BITS
300S	C	8/12/2000	18:54	ST_I	>4	2	>4	0	0	6.67	6.99	0.33	6.83	6.67	6.99	6.83	0	0	0	3.01	6.99	5.4	0	7	BIOGENIC	NO	AMBIENT SANDY MUD; ORG DETRITUS; MANY SHELL FINES @ Z
300S	D	8/13/2000	12:50	ST_II	>4	3	>4	0	0	10.98	11.75	0.77	11.37	10.98	11.75	11.37	0	0	0	0.44	4.92	3.14	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; PARTLY DECAYING AMPS&ORG DETRITUS; SHELL FINES@Z
300WSW	A	8/12/2000	20:21	ST_II	>4	3	>4	0	0	13.06	14.1	1.04	13.58	13.06	14.1	13.58	0	0	0	0.6	1.15	0.91	0	5	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DISTD ADULT AMPS; SHELL LAG
300WSW	B	8/12/2000	20:21	ST_II_ON_III	>4	3	>4	0	0	13.72	15.68	1.97	14.7	13.72	15.68	14.7	0	0	0	1.97	4.48	2.98	0	9	PHYSICAL	NO	DM>P; SANDY/GREY CLAY; VOID; BURROWS/OPENING; ADULT & JUVENILE AMPS; SHELL BITS; JUVENILE CHAETOPTERUS?
300WSW	C	8/12/2000	20:23	ST_II	>4	3	>4	0	0	15.3	16.28	0.98	15.79	15.3	16.28	15.79	0	0	0	1.26	3.93	2.16	0	6	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYED AMP MAT; SHELL BITS/FINES SUBSURF; MULINIA?
300W	A	8/12/2000	20:38	ST_II	>4	3	>4	0	0	11.53	12.51	0.98	12.02	11.53	12.51	12.02	0	0	0	0.48	6.61	4.45	0	9	BIOGENIC	NO	SANDY MUD; POSS OLD DM?; DECAYING AMP MATS & ORG DETRITUS; SHELL PIECE
300W	B	8/12/2000	20:38	ST_II	>4	3	>4	0	0	11.86	12.51	0.66	12.19	11.86	12.51	12.19	0	0	0	2.51	7.38	5.04	0	9	BIOGENIC	NO	SANDY MUD; POSS OLD DM?; DECAYING AMPS
300W	C	8/12/2000	20:39	ST_II_ON_III	>4	3	>4	0	0	13.39	14.21	0.82	13.8	13.39	14.21	13.8	0	0	0	0.6	2.4	1.23	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; VOID/BURROWS; DECAYING AMPS & ORG DETRITUS
300W	D	8/12/2000	20:41	ST_II	>4	3	>4	0	0	12.27	13.46	1.19	12.86	12.27	13.46	12.86	0	0	0	2.81	5.3	4.18	0	9	BIOGENIC	NO	SANDY MUD; POSS OLD DM?; DECAYED AMPS; SHELL BITS/FINES IN SUBSURF SEDS
300W	E	8/13/2000	12:59	ST_II	>4	3	>4	0	0	10.43	15.03	4.59	12.73	10.43	15.03	12.73	0	0	0	0.16	5.03	2.96	0	7	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; DECAYED AMPS; SHELL BITS
300NW	A	8/12/2000	17:50	ST_II	>4	3	>4	0	0	13.39	15.08	1.69	14.23	13.39	15.08	14.23	0	0	0	0.16	1.88	1.28	0	5	BIOGENIC	NO	DM>P; SANDY MUD; JUVENILE & ADULT AMPS; AMPELISCA
300NW	B	8/12/2000	17:51	ST_I	>4	3	>4	0	0	3.06	13.11	10.05	8.09	3.06	13.11	8.09	0	0	0	0.05	1.34	0.54	0	2	PHYSICAL	NO	DM>P; UNEVEN SURF; RPD=NOT WELL DEVELOPED
300NW	C	8/12/2000	17:52	ST_II_ON_III	>4	3	>4	0	0	9.07	12.51	3.44	10.79	9.07	12.51	10.79	0	0	0	0.11	5.52	2.45	0	9	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT; SHELL PIECES; SM VOID
300NW	D	8/13/2000	13:03	ST_II_ON_III	>4	3	>4	0	0	16.45	17.21	0.77	16.83	16.45	17.21	16.83	0	0	0	1.83	4.68	3.22	0	10	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT; SHELL PIECE; VOID
450N	A	8/12/2000	19:25	ST_II_ON_III	>4	2	>4	0	0	9.4	10.27	0.87	9.84	9.4	10.27	9.84	0	0	0	1.48	4.43	3.14	0	10	BIOGENIC	NO	AMBIENT SANDY MUD; ACTIVE&DECAYING AMPS& ORG DETRITUS; VOID; SHELL BITS & FINES @ Z
450N	B	8/12/2000	19:26	ST_II_ON_III	>4	3	>4	0	0	14.64	15.36	0.71	15	14.64	15.36	15	0	0	0	2.19	6.78	4.53	0	11	BIOGENIC	NO	AMBIENT SANDY MUD;ADULT AMPELISCA AMPS;DECAYED AMPS;SHELL;VOIDS/BURROWS
450N	C	8/12/2000	19:26	ST_II	>4	3	>4	0	0	11.26	13.17	1.91	12.21	11.26	13.17	12.21	0	0	0	0.11	5.25	2.94	0	7	BIOGENIC	NO	AMBIENT SANDY MUD; JUVENILE AMPELISCA AMPHIPODS
450NE	A	8/12/2000	19:32	ST_II	>4	2	>4	0	0	8.36	9.34	0.98	8.85	8.36	9.34	8.85	0	0	0	0.38	4.81	2.55	0	7	BIOGENIC	NO	AMBIENT SANDY MUD; DECAYING AMPS; SHELL @ Z
450NE	B	8/12/2000	19:32	ST_II	>4	3	>4	0	0	10.71	11.64	0.93	11.17	10.71	11.64	11.17	0	0	0	3.33	7.9	6	0	9	BIOGENIC	NO	AMBIENT SANDY MUD; JUVENILE & ADULT AMPS; ORG DETRITUS
450NE	C	8/12/2000	19:33	ST_II_ON_III	>4	2	>4	0	0	11.2	11.69	0.49	11.45	11.2	11.69	11.45	0	0	0	1.04	5.08	2.67	0	9	BIOGENIC	NO	AMBIENT SANDY MUD; JUVENILE AMPS; VOID/BURROW; SHELL FINES IN SUBSURF SEDS
450WSW	A	8/12/2000	20:29	ST_II_ON_III	>4	3	>4	0	0	17.16	18.03	0.87	17.6	17.16	18.03	17.6	0	0	0	0.93	3.17	1.53	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ACTIVE & DECAYING AMPS; VOIDS
450WSW	B	8/12/2000	20:30	ST_II	>4	3	>4	0	0	16.18	16.94	0.76	16.56	16.18	16.94	16.56	0	0	0	2.37	4.09	3.16	0	8	BIOGENIC	NO	DM>P; SANDY/GREY CLAY; ACTIVE & DECAYING AMPS
450WSW	C	8/12/2000	20:31	ST_II_ON_III	>4	3	>4	0	0	17.16	19.23	2.08	18.2	17.16	19.23	18.2	0	0	0	1.91	7.54	5.5	0	11	PHYSICAL	NO	DM>P; SANDY/GREY CLAY; VOID/BURROW; DISTD AMP; SHELL BITS @ SUBSURF
450NW	A	8/12/2000	17:40	ST_I_TO_II	>4	3	>4	0	0	12.02	12.57	0.55	12.3	12.02	12.57	12.3	0	0	0	1.42	4.04	3.07	0	7	BIOGENIC	NO	DM>P; SANDY MUD; DECAYED AMP MAT; STG 1 TUBES; WORM @ Z
450NW	B	8/12/2000	17:41	ST_II_ON_III	>4	2	>4	0	0	12.3	13.01	0.71	12.65	12.3	13.01	12.65	0	0	0	0.38	5.96	3.4	0	10	BIOGENIC	NO	DM>P; SANDY MUD; VOIDS; ACTIVE & DECAYING AMPS; AMPELISCA
450NW	C	8/12/2000	17:42	ST_II_ON_III	>4	2	>4	0	0	10.93	13.5	2.57	12.21	10.93	13.5	12.21	0	0	0	0.93	3.72	2.51	0	9	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT; LG BURROWS; VOID; WIPER CLAST/SMEAR

Appendix B3

Station	Replicate	Date	Time	Successional Stage	Grain Size (phi)			Mud Clasts		Camera Penetration (cm)				Dredged Material Thickness (cm)			Redox Rebound Thickness			Apparent RPD Thickness (cm)			Methane	OSI	Surface Roughness	Low DO	Comments
					Min	Max	Maj Mode	Count	Avg. Diam.	Min	Max	Range	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean					
USCGA																											
CTR	A	8/12/2000	14:14	ST_II	2	>4	>4	0	0	15.36	15.52	0.16	15.44	15.36	15.52	15.44	0	0	0	0.11	5.85	4.45	0	9	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT
CTR	B	8/12/2000	14:14	ST_II	2	>4	>4	0	0	16.83	17.7	0.87	17.27	16.83	17.7	17.27	0	0	0	4.15	7.43	5.86	0	9	BIOGENIC	NO	DM>P; CONSOLIDATED CLAY; AMPELISCA, ADULT & DECAYING AMP MAT
CTR	C	8/12/2000	14:16	ST_II	2	>4	>4	0	0	15.63	16.67	1.04	16.15	15.63	16.67	16.15	0	0	0	1.24	4.35	2.52	0	7	BIOGENIC	NO	DM>P; CONS CLAY W/SANDY SURF; DECAYED AMP MAT; LG BURROWS; SHELL BITS@Z
050N	A	8/12/2000	17:21	ST_II_ON_III	3	>4	>4	0	0	10.98	11.26	0.27	11.12	10.98	11.26	11.12	0	0	0	0.05	2.31	1.02	0	7	BIOGENIC	NO	DM>P; DECAYING AMPS; SHELL PIECES; BURROW OPENING; VOID
050N	B	8/12/2000	17:21	ST_II_ON_III	3	>4	>4	0	0	13.44	14.21	0.76	13.83	13.44	14.21	13.83	0	0	0	0.11	1.61	0.7	0	6	BIOGENIC	NO	DM>P; GREY CLAY; JUVENILE&ADULT ACTIVE AMPS; AMPELISCA; VOID; SHELL PIECES; THIN RPD
050N	C	8/12/2000	17:22	ST_II	3	>4	>4	0	0	13.39	14.37	0.98	13.88	13.39	14.37	13.88	0	0	0	0.05	2.47	1.4	0	5	BIOGENIC	NO	DM>P; SANDY MUD; ACTIVE ADULT & JUVENILE AMPS; AMPELISCA; SHELL
050E	A	8/12/2000	14:08	ST_I_TO_II	2	>4	>4	0	0	11.2	13.39	2.19	12.3	11.2	13.39	12.3	0	0	0	1.53	5.19	3.45	0	7	BIOGENIC	NO	DM>P; SANDY MUD; SHELL; DISTD & ALIVE AMP TUBES
050E	B	8/12/2000	14:09	ST_II	2	>4	>4	0	0	16.67	17.21	0.55	16.94	16.67	17.21	16.94	0	0	0	3.06	9.07	6.53	0	9	BIOGENIC	NO	DM>P; CONSOLIDATED CLAY; DECAYING AMP MAT
050E	C	8/12/2000	14:10	ST_II	2	>4	>4	0	0	18.96	19.51	0.55	19.23	18.96	19.51	19.23	0	0	0	0.44	10.33	7.24	0	9	PHYSICAL	NO	DM>P; SANDY MUD; JUVENILE AMP TUBES; AMPELISCA; BURROW; WIPER CLASTS/SMEARS
050SE	A	8/12/2000	14:35	ST_I_TO_II	2	>4	>4	0	0	12.95	14.64	1.69	13.8	12.95	14.64	13.8	0	0	0	2.31	4.89	3.43	0	7	PHYSICAL	NO	DM>P; JUVENILE AMP; BURROW
050SE	B	8/12/2000	14:36	ST_I_ON_III	2	>4	>4	0	0	14.48	15.85	1.37	15.16	14.48	15.85	15.16	0	0	0	0.32	6.72	2.33	0	9	PHYSICAL	NO	DM>P; SANDY MUD; VOID; SHELLS & PIECES
050SE	C	8/12/2000	14:37	ST_II	3	>4	>4	0	0	13.61	13.93	0.33	13.77	13.61	13.93	13.77	0	0	0	0.16	4.75	3.16	0	8	BIOGENIC	NO	DM>P; SANDY MUD; JUVENILE AMP MAT; SHELLS; DECAYED AMPS & ORG DETRITUS
050S	A	8/12/2000	14:38	ST_II	2	>4	>4	0	0	14.7	16.23	1.53	15.46	14.7	16.23	15.46	0	0	0	1.15	8.2	5.2	0	9	BIOGENIC	NO	DM>P; SANDY MUD; ADULT&DECAYED AMPS; AMPELISCA; WORM@Z; SHELL PIECES@Z
050S	B	8/12/2000	14:41	ST_I_ON_III	2	>4	>4	4	0.18	16.17	17.92	1.75	17.05	16.17	17.92	17.05	0	0	0	0.66	6.89	4.71	0	11	PHYSICAL	NO	DM>P; SANDY MUD; VOID; BURROW OPENING; RED MUD CLASTS; SM SHELL PIECES @ Z
050S	C	8/12/2000	14:41	ST_I	3	>4	>4	0	0	14.59	15.57	0.98	15.08	14.59	15.57	15.08	0	0	0	2.42	7.15	3.85	0	7	BIOGENIC	NO	DM>P; DECAYED AMP MAT
050W	A	8/12/2000	14:17	ST_II_ON_III	2	>4	>4	0	0	16.28	17.16	0.87	16.72	16.28	17.16	16.72	0	0	0	3.61	6.28	4.94	0	11	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT; BURROW OPENING; VOID; SHELL BITS
050W	B	8/12/2000	14:20	ST_I	3	>4	>4	0	0	14.59	15.3	0.71	14.95	14.59	15.3	14.95	0	0	0	0.11	6.78	4.5	0	7	PHYSICAL	NO	DM>P; SANDY MUD; LG BURROW OPENING; SHELLS; WHT TUBE?
050W	C	8/12/2000	14:20	ST_II	3	>4	>4	0	0	16.67	18.2	1.53	17.43	16.67	18.2	17.43	0	0	0	0.71	6.28	3.79	0	9	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT; SM SHELL BITS
100N	A	8/12/2000	17:14	ST_II	3	>4	>4	0	0	17.32	20.82	3.5	19.07	17.32	20.82	19.07	0	0	0	NA	NA	NA	0	99	BIOGENIC	NO	DM>P; OVER PEN; ADULT AMPS
100N	B	8/12/2000	17:15	ST_II	3	>4	>4	0	0	17.49	17.98	0.49	17.73	17.49	17.98	17.73	0	0	0	0.75	4.46	2.97	0	7	BIOGENIC	NO	DM>P; SANDY CLAY; JUVENILE AMPS; WIPER CLAST
100N	C	8/12/2000	17:16	ST_II	3	>4	>4	0	0	16.5	17.92	1.42	17.21	16.5	17.92	17.21	0	0	0	1.34	5	2.86	0	7	BIOGENIC	NO	DM>P; SANDY MUD; ADULT ACTIVE & DECAYING AMPS; WIPER CLASTS/SMEARS
100N	D	8/12/2000	17:17	ST_II	2	>4	>4	0	0	15.3	15.96	0.66	15.63	15.3	15.96	15.63	0	0	0	0.7	3.87	2.08	0	6	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING & DISTD AMP MATS; SHELL BITS; FECAL MOUND
100N	E	8/13/2000	12:19	ST_II	3	>4	>4	0	0	13.06	14.7	1.64	13.88	13.06	14.7	13.88	0	0	0	1.09	4.32	3.08	0	8	BIOGENIC	NO	DM>P; SANDY MUD; JUVENILE & ADULT AMPS; SHELL BITS; DECAYING AMPS
100E	A	8/12/2000	14:03	ST_II	2	>4	>4	0	0	12.95	16.07	3.11	14.51	12.95	16.07	14.51	0	0	0	2.57	6.17	4.38	0	9	BIOGENIC	NO	DM>P; SANDY MUD; SHELLS & SHELL PIECES; AMPELISCA
100E	B	8/12/2000	14:04	ST_III	2	>4	>4	0	0	11.75	13.55	1.8	12.65	11.75	13.55	12.65	0	0	0	0.87	7.49	4.63	0	11	BIOGENIC	NO	DM>P; SANDY MUD; CHAETOPTERUS; DISTD AMPS; SHELL BITS @ Z
100E	C	8/12/2000	14:05	ST_I	2	>4	>4	0	0	14.26	17.21	2.95	15.74	14.26	17.21	15.74	0	0	0	1.15	7.16	4.53	0	7	PHYSICAL	NO	DM>P; SANDY MUD; SHELLS & SHELL BITS; BURROW OPENING
100SE	A	8/12/2000	14:30	ST_II_ON_III	3	>4	>4	0	0	14.86	15.96	1.09	15.41	14.86	15.96	15.41	0	0	0	3.61	8.03	5.85	0	11	BIOGENIC	NO	DM>P; SANDY MUD; 2 CHAETOPERUS; BRYOZOANS; SHELL BITS @ Z; DISTD AMP MAT
100SE	B	8/12/2000	14:31	INDET	3	>4	>4	0	0	14.75	16.83	2.08	15.79	14.75	16.83	15.79	0	0	0	NA	NA	NA	0	99	INDET	NO	DM>P; SANDY-CLAYEY MUD; SHELL BITS; FLUID SURF LAYER
100SE	C	8/12/2000	14:32	ST_II	3	>4	>4	0	0	10	13.01	3.01	11.5	10	13.01	11.5	0	0	0	0.05	4.92	2.37	0	7	PHYSICAL	NO	DM>P; LG HORIZ & VERT BURROWS/OPENING; SHELLS & BITS; DISTD AMPS
100SE	D	8/13/2000	12:26	ST_II_ON_III	2	>4	>4	0	0	12.95	14.64	1.69	13.8	12.95	14.64	13.8	0	0	0	2.08	7.54	5.83	0	11	PHYSICAL	NO	DM>P; JUVENILE AMP; BURROW; PRISM SPLIT A CHAETOPTERUS TUBES
100SE	E	8/13/2000	12:26	ST_I_TO_II	2	>4	>4	0	0	12.95	14.64	1.69	13.8	12.95	14.64	13.8	0	0	0	0.48	3.49	1.73	0	5	PHYSICAL	NO	DM>P; JUVENILE AMP
100S	A	8/12/2000	16:27	ST_II_ON_III	3	>4	>4	0	0	11.37	12.68	1.31	12.02	11.37	12.68	12.02	0	0	0	2.1	4.25	3.28	0	10	BIOGENIC	NO	DM>P; SANDY MUD; SHELLS & PIECES; VOIDS; DECAYED AMPS
100S	B	8/12/2000	16:30	ST_II_ON_III	2	>4	>4	0	0	15.46	16.78	1.31	16.12	15.46	16.78	16.12	0	0	0	1.67	4.41	2.92	0	9	BIOGENIC	NO	DM>P; RECUMBANT CHAETOPTERUS; AMPHIPOD STALKS IN FARFIELD; VOID; SHELL BITS
100S	C	8/12/2000	16:31	ST_II	2	>4	>4	0	0	14.37	15.52	1.15	14.95	14.37	15.52	14.95	0	0	0	1.97	6.12	3.87	0	9	BIOGENIC	NO	DM>P; SANDY MUD; JUVENILE-ADULT&DECAYED AMPS; AMPHIPOD STALKS; SHELL BITS/PIECES
100S	D	8/12/2000	16:36	ST_II	2	>4	>4	0	0	14.97	16.17	1.2	15.57	14.97	16.17	15.57	0	0	0	0.75	2.53	1.63	0	6	BIOGENIC	NO	DM>P; JUVENILE & ADULT AMPS; AMPELISCA
100S	E	8/12/2000	16:37	ST_II_ON_III	3	>4	>4	0	0	11.31	13.17	1.86	12.24	11.31	13.17	12.24	0	0	0	0.22	0.91	0.52	0	6	BIOGENIC	NO	DM>P; CHAETOPTERUS; BRYOZOANS; BURROW OPENINGS; SHELLS/PIECES; THIN RPD
100W	A	8/12/2000	14:23	ST_II_ON_III	3	>4	>4	0	0	17.71	20.71	3.01	19.21	17.71	20.71	19.21	0	0	0	2.62	9.51	7.21	0	11	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT; VOIDS
100W	B	8/12/2000	14:24	ST_II_ON_III	3	>4	>4	0	0	14.7	16.39	1.69	15.55	14.7	16.39	15.55	0	0	0	1.64	5.74	4.4	0	11	BIOGENIC	NO	DM>P; SANDY MUD; DECAYING AMP MAT; VOID; BURROW
100W	C	8/12/2000	14:25	ST_II_ON_III	2	>4	>4	0	0	13.5	13.66	0.16	13.58	13.5	13.66	13.58	0	0	0	0.11	4.64	2.86	0	9	BIOGENIC	NO	DM>P; SANDY MUD; ADULT & DECAYING AMPS; CHAETOPTERUS IN FARFIELD
150E	A	8/12/2000	13:56	ST_II	2	>4	>4	0	0	12.62	14.37	1.75	13.5	12.62	14.37	13.5	0	0	0	1.64	5.96	3.64	0	8	BIOGENIC	NO	DM>P; SANDY MUD; ACTIVE JUVENILE & ADULT AMPS; SHELL BITS
150E	B	8/12/2000	13:57	ST_III	2	>4	>4	0	0	11.37	12.95	1.58	12.16	11.37	12.95	12.16	0	0	0	1.64	6.56	4.62	0	11	PHYSICAL	NO	DM>P; S/M; CHAETOPTERUS; WIPER CLASTS/SMEARS
150E	D	8/13/2000	12:23	ST_II_ON_III	2	>4	>4	0	0	4.54	6.34	1.8	5.44	4.54	6.34	5.44	0	0	0	0.22	3.83	2.64	0	9	BIOGENIC	NO	DM>P; SANDY MUD; CHAETOPTERUS IN FARFIELD; ACTIVE & DECAYING AMP TUBES
150S	A	8/12/2000	16:18	ST_III	3	>4	>4	0	0	19.07	19.34	0.27	19.21	19.07	19.34	19.21	0	0	0	0.11	7.69	4.66	0	11	INDET	NO	DM>P; FLUID SURF LAYER; VOID; BURROWS; SHELL BITS IN SUBSURF SEDS
150S	B	8/12/2000	16:21	ST_II_ON_III	2	>4	>4	0	0	16.94	18.09	1.15	17.51	16.94	18.09	17.51	0	0	0	0.22	7.38	5.82	0	11	BIOGENIC	NO	DM>P; DECAYED AMP MAT; VOID; LG BURROW; SHELL BITS IN SUBSURF SEDS; SHELLS @SURF
150S	C	8/12/2000	16:22	ST_II_ON_III	2	>4	>4	0	0	15.03	16.67	1.64	15.85	15.03	16.67	15.85	0	0	0	3.5	6.83	5.19	0	11	PHYSICAL	NO	DM>P; CHAETOPTERUS; AMPHIPOD; SHELLS
150S	D	8/12/2000	16:23	ST_II	3	>4	>4	0	0	14.32	16.12	1.8	15.22	14.32	16.12	15.22	0	0	0	0.27	3.28	1.53	0	6	BIOGENIC	NO	DM>P; JUVENILE & SOME ADULT AMPS; SHELL BITS @ SURF

Appendix B4

Station	Replicate	Date	Time	Successional Stage	Grain Size (phi)			Mud Clasts		Camera Penetration (cm)				Dredged Material Thickness (cm)			Redox Rebound Thickness			Apparent RPD Thickness (cm)			Methane	OSI	Surface Roughness	Low DO	Comments
					Min	Max	Maj Mode	Count	Avg. Diam.	Min	Max	Range	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean					
NL-1	A	8/13/2000	15:17	ST_I	3	>4	4 to 3	0	0	1.84	2.81	0.97	2.32	1.84	2.81	2.32	0	0	0	0.16	2.43	1.65	0	4	PHYSICAL	NO	V FINE S>P; RPD>P; SHELLS/PIECES; BURROW OPENING; DEAD EELGRASS
NL-1	B	8/12/2000	15:18	ST_I	2	4	4 to 3	0	0	2.43	3.41	0.97	2.92	2.43	3.41	2.92	0	0	0	1.51	3.73	2.67	0	5	PHYSICAL	NO	V FINE S>P; RPD>P; SHELL PIECES; AMPHIPOD STALKS
NL-1	C	8/13/2000	15:19	ST_I	2	>4	4 to 3	0	0	3.08	3.51	0.43	3.3	3.08	3.51	3.3	0	0	0	0.92	2.43	1.72	0	4	PHYSICAL	NO	V FINE SAND/MUD; SM ROCKS; ORG DEBRIS
NL-1	D	8/13/2000	12:02	ST_I	2	>4	4 to 3	0	0	4.59	5.46	0.86	5.03	4.59	5.46	5.03	0	0	0	0.38	3.95	2.2	0	4	PHYSICAL	NO	V FINE S/MUD; SHELL PIECES
NL-1	E	8/13/2000	12:03	ST_II	2	>4	4 to 3	0	0	2.65	3.68	1.03	3.16	2.65	3.68	3.16	0	0	0	0.92	3.03	2.62	0	7	BIOGENIC	NO	V FINE S>P; RPD>P; JUVENILE AMPS?; SHELL PIECES;SM TUBERLIKE WORMS ON LEFT
NL-1	F	8/13/2000	12:04	ST_I	2	>4	4 to 3	0	0	2.85	6.02	3.17	4.44	2.85	6.02	4.44	0	0	0	1.72	4.68	4.04	0	7	PHYSICAL	NO	V FINE S>P; RPD>P; CREPIDULA SHELLS; ORG DETRITUS
NL-2	A	8/12/2000	15:32	ST_I_TO_II	2	>4	>4	0	0	9.3	10.65	1.35	9.97	9.3	10.65	9.97	0	0	0	0.27	3.89	2.34	0	6	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE AMPS?; WIPER CLAST; SHELL BITS SUBSURF
NL-2	B	8/12/2000	15:33	ST_II	2	>4	>4	0	0	9.08	9.89	0.81	9.49	9.08	9.89	9.49	0	0	0	0.11	3.73	1.9	0	6	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE AMPS; SHELL BITS; POLY TUBES; ORG DETRITUS
NL-2	C	8/12/2000	15:34	ST_II	2	>4	>4	0	0	8.81	10.38	1.57	9.59	8.81	10.38	9.59	0	0	0	0.11	3.08	1.63	0	6	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE AMPS; DECAYED AMP MAT; ORG DETRITUS
NL-3	A	8/12/2000	15:25	ST_II_ON_III	2	>4	>4	0	0	6.97	7.41	0.43	7.19	6.97	7.41	7.19	0	0	0	1.94	4.89	3.23	0	10	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE-ADULT & DECAYED AMPS; SM VOID
NL-3	B	8/12/2000	15:27	ST_II	2	>4	>4	0	0	4.86	5.78	0.92	5.32	4.86	5.78	5.32	0	0	0	0.05	4.11	1.51	0	6	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE AMPS; ORG FRONDS; SHELL BITS
NL-3	C	8/12/2000	15:27	ST_II	2	>4	>4	0	0	8.22	9.89	1.68	9.05	8.22	9.89	9.05	0	0	0	0.16	5.35	3.21	0	8	BIOGENIC	NO	SANDY MUD>P; JUVENILE AMPS; SHELL PIECE; ORG DETRITUS
NL-3	D	8/13/2000	11:56	ST_II	2	>4	>4	0	0	8.43	8.92	0.49	8.68	8.43	8.92	8.68	0	0	0	2.47	5.65	3.77	0	9	BIOGENIC	NO	SANDY MUD/MUD; ADULT-JUVENILE & DECAYED AMPS; ORG DETRITUS
NL-3	E	8/13/2000	11:57	ST_II	2	>4	>4	0	0	8.11	9.35	1.24	8.73	8.11	9.35	8.73	0	0	0	1.73	6.05	3.36	0	8	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE-ADULT & DECAYED AMPS; ORG DETRITUS
NL-3	F	8/13/2000	11:57	ST_II	2	>4	>4	0	0	8.43	9.35	0.92	8.89	8.43	9.35	8.89	0	0	0	0.05	2.97	1.72	0	6	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE & ADULT AMPS; AMPELISCA; BURROW; WIPER CLASTS/SMEARS
NL-4	A	8/12/2000	15:42	ST_II	2	>4	>4	0	0	9.03	9.51	0.49	9.27	9.03	9.51	9.27	0	0	0	0.05	4.09	2.52	0	7	BIOGENIC	NO	V FINE S/MUD; DECAYED AMPS; POLY TUBES; ORG DETRITUS
NL-4	B	8/12/2000	15:42	ST_II	2	>4	>4	0	0	8.7	9.35	0.65	9.03	8.7	9.35	9.03	0	0	0	0.05	3.28	2.29	0	7	BIOGENIC	NO	SANDY MUD/MUD; JUV & ADULT AMPS; DECAYED TUBES; WIPER CLASTS/SMEARS
NL-4	C	8/12/2000	15:43	ST_II	2	>4	>4	0	0	6.7	7.19	0.49	6.95	6.7	7.19	6.95	0	0	0	NA	NA	NA	0	99	BIOGENIC	NO	SANDY MUD/MUD; JUV AMPS; POLY TUBES; DECAYED AMPS; WIPER CLASTS/SMEARS
NE-Ref																											
NE-1	A	8/12/2000	15:57	ST_I_TO_II	2	>4	>4	0	0	10.92	11.3	0.38	11.11	10.92	11.3	11.11	0	0	0	1.3	2.97	2.18	0	5	BIOGENIC	NO	SANDY MUD/MUD; JUVENILE AMPS; HYDROIDS ON ROCK; ORG DETRITUS
NE-1	B	8/12/2000	15:58	ST_I_TO_II	2	>4	>4	0	0	10.27	10.59	0.32	10.43	10.27	10.59	10.43	0	0	0	0.27	3.51	1.98	0	5	PHYSICAL	NO	SANDY MUD/MUD; JUVENILE AMPS; ORG DETRITUS; WIPER CLASTS/SMEARS
NE-1	C	8/12/2000	15:58	ST_I	2	>4	>4	0	0	10.16	10.43	0.27	10.3	10.16	10.43	10.3	0	0	0	0.22	3.46	1.82	0	4	PHYSICAL	NO	SANDY MUD/MUD; WIPER CLASTS/SMEARS
NE-2	A	8/12/2000	15:52	ST_I	2	>4	>4	0	0	15.3	15.62	0.32	15.46	15.3	15.62	15.46	0	0	0	0.54	5.84	3.65	0	6	PHYSICAL	NO	SANDY MUD/MUD; LG VERT BURROW; STG 1 TUBES
NE-2	B	8/12/2000	15:53	ST_I_TO_II	2	>4	>4	0	0	12.86	13.73	0.86	13.3	12.86	13.73	13.3	0	0	0	2.2	4.78	3.5	0	7	PHYSICAL	NO	SANDY MUD/MUD; STG 1 TUBES; AMP TUBE
NE-2	C	8/12/2000	15:54	ST_I	2	>4	>4	0	0	11.24	12.43	1.19	11.84	11.24	12.43	11.84	0	0	0	NA	NA	NA	0	99	PHYSICAL	NO	SANDY MUD/MUD; STG 1 TUBES; WIPER CLASTS/SMEARS
NE-3	A	8/12/2000	16:06	ST_I_ON_III	2	>4	>4	0	0	12.43	12.81	0.38	12.62	12.43	12.81	12.62	0	0	0	1.14	4.43	2.54	0	9	PHYSICAL	NO	SANDY MUD/MUD; VOIDS; WORM @ Z; TUBES
NE-3	B	8/12/2000	16:07	ST_I	2	>4	>4	0	0	10.54	10.81	0.27	10.68	10.54	10.81	10.68	0	0	0	0.05	3.46	2.18	0	4	PHYSICAL	NO	SANDY MUD/MUD; MANY STG 1 TUBES; WIPER CLASTS/SMEARS
NE-3	C	8/12/2000	16:08	ST_I_ON_III	2	>4	>4	0	0	11.35	11.73	0.38	11.54	11.35	11.73	11.54	0	0	0	0.54	4.09	2.49	0	9	PHYSICAL	NO	SANDY MUD/MUD; WORMS @ Z; TUBES; SM VOID; WIPER CLASTS/SMEARS
NE-4	A	8/12/2000	16:01	ST_I	2	>4	>4	0	0	12.65	13.51	0.86	13.08	12.65	13.51	13.08	0	0	0	2.31	4.03	3.07	0	6	PHYSICAL	NO	SANDY MUD/MUD; STG 1 TUBES
NE-4	B	8/12/2000	16:02	ST_I_TO_II	2	>4	>4	0	0	12.11	12.32	0.22	12.22	12.11	12.32	12.22	0	0	0	0.05	4	2.47	0	6	PHYSICAL	NO	SANDY MUD/MUD; STG 1 TUBES; JUVENILE AMPS; WIPER CLASTS/SMEARS
NE-4	C	8/12/2000	16:03	ST_I_ON_III	2	>4	>4	1	0.49	14.22	15.14	0.92	14.68	14.22	15.14	14.68	0	0	0	0.76	3.35	1.97	0	8	PHYSICAL	NO	SANDY MUD/MUD; VOID; WIPER CLAST; OX CLAST
West-Ref																											
WR-1	A	8/13/2000	13:59	ST_II	2	>4	>4	0	0	11.37	12.25	0.88	11.81	11.37	12.25	11.81	0	0	0	0.33	5.77	2.97	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; SHELLS; SHELL BITS/FINES SUBSURF; HYDROIDS
WR-1	B	8/13/2000	14:00	ST_II_ON_III	2	>4	>4	0	0	8.68	9.45	0.77	9.07	8.68	9.45	9.07	0	0	0	0.22	4.67	3.06	0	10	BIOGENIC	NO	AMBIENT SANDY MUD>P; VOIDS; DECAYED AMPS; SHELL; SMEARED RPD
WR-1	C	8/13/2000	14:00	ST_II	2	>4	>4	0	0	11.43	11.92	0.49	11.68	11.43	11.92	11.68	0	0	0	1.92	5.82	4.16	0	9	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & DECAYING AMPS; SHELL BITS; ORG DETRITUS
WR-1	D	8/13/2000	14:10	ST_II	2	>4	>4	0	0	5.93	6.81	0.88	6.37	5.93	6.81	6.37	0	0	0	1.04	5.66	3.29	0	8	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & DECAYING AMPS; SHELLS & PIECES; SHELL FINES @ Z
WR-1	E	8/13/2000	14:11	ST_II	2	>4	>4	0	0	9.73	10.99	1.26	10.36	9.73	10.99	10.36	0	0	0	0.11	4.78	2.95	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; DECAYING & DISTD AMPS; SHELL BITS; MUSSELS
WR-1	F	8/13/2000	14:12	ST_II	2	>4	>4	0	0	9.4	10.11	0.71	9.75	9.4	10.11	9.75	0	0	0	0.11	5.11	3.39	0	8	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & JUVENILE AMPS; SHELL FINES SUBSURF; WIPER SMEARS, ORG DETRITUS
WR-2	A	8/13/2000	14:05	ST_II	2	>4	>4	0	0	9.67	10.33	0.66	10	9.67	10.33	10	0	0	0	0.44	3.52	2.42	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; ADULT & JUVENILE AMPS; SHELL BITS/FINES @ Z
WR-2	B	8/13/2000	14:06	ST_II	2	>4	>4	0	0	10.16	11.04	0.88	10.6	10.16	11.04	10.6	0	0	0	0.05	5.38	2.98	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; DECAYING AMPS; AMPHIPOD STALKS; SHELL; SHELL FINES @ Z
WR-2	C	8/13/2000	14:06	ST_II	2	>4	>4	0	0	10.77	11.37	0.6	11.07	10.77	11.37	11.07	0	0	0	1.54	4.56	2.97	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; ADULT & JUVENILE AMPS; SHELL BITS & FINES SUBSURF
WR-2	D	8/13/2000	14:26	ST_II	2	>4	>4	0	0	6.98	7.97	0.99	7.47	6.98	7.97	7.47	0	0	0	0.11	2.86	1.58	0	6	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & DECAYING AMPS; SHELL BITS; SHELL BITS/FINES @ Z
WR-2	E	8/13/2000	14:27	ST_II	2	>4	>4	0	0	7.69	8.63	0.93	8.16	7.69	8.63	8.16	0	0	0	0.05	4.56	2.37	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; JUVENI & ADULT AMPS; AMPELISCA; AMPHI STALKS; SHELL FINES@Z
WR-3	A	8/13/2000	13:25	ST_II_ON_III	1	>4	>4	0	0	12.38	12.92	0.54	12.65	12.38	12.92	12.65	0	0	0	0.65	5.95	3.33	0	10	BIOGENIC	NO	MUD>P; SHELL FINES THROUGHOUT; ADULT AMPS; BURROWS/VOID; SHELL; AMPHIPOD STALK
WR-3	B	8/13/2000	13:26	ST_II	3	>4	>4	0	0	12.54	14.27	1.73	13.41	12.54	14.27	13.41	0	0	0	0.11	4.92	2.54	0	7	BIOGENIC	NO	MUD>P; SHELL FINES THROUGHOUT; JUVENILE AMPS; SHELLS/PIECES; DETRITUS
WR-3	C	8/13/2000	13:26	ST_II	3	>4	>4	0	0	10.16	10.65	0.49	10.41	10.16	10.65	10.41	0	0	0	1.08	4.49	3.41	0	8	BIOGENIC	NO	MUD>P; SHELL FINES THROUGHOUT; JUVENILE & ADULT AMPS; AMPELISCA
WR-3	D	8/13/2000	14:33	ST_II	2	>4	>4	0	0	8.24	9.07	0.82	8.65	8.24	9.07	8.65	0	0	0	0.33	3.9	2.88	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; DECAYING & ALIVE AMPS; SHELL FRAG; FECAL MOUND
WR-3	E	8/13/2000	14:34	ST_II	2	>4	>4	0	0	2.47	5.66	3.19	4.07	2.47	5.66	4.07	0	0	0	0.71	3.79	2.68	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; DECAYING AMPS; SHELL FINES @ Z; SM CHAETOPTERUS?
WR-3	F	8/13/2000	14:35	ST_II	2	>4	>4	0	0	10.49	11.15	0.66	10.82	10.49	11.15	10.82	0	0	0	1.21	5.66	4.13	0	9	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & DECAYING AMPS; SHELL FINES @ Z
WR-4	A	8/13/2000	13:32	ST_II	2	>4	>4	0	0	4.95	7.25	2.31	6.1	4.95	7.25	6.1	0	0	0	1.54	3.85	2.76	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & DECAYING AMPS; AMPELISCA; SHELLS- BITS/FINES @ Z
WR-4	B	8/13/2000	13:33	ST_I	2	>4	>4	0	0	7.09	7.86	0.77	7.47	7.09	7.86	7.47	0	0	0	0.22	1.92	1.2	0	3	PHYSICAL	NO	AMBIENT SANDY MUD>P; WINNOWING; SHELL BITS/PIECES; SHELL FINES@Z; WIPER CLAST/SMEAR
WR-4	C	8/13/2000	13:33	ST_II	2	>4	>4	0	0	6.76	8.46	1.7	7.61	6.76	8.46	7.61	0	0	0	0.11	3.85	1.95	0	6	BIOGENIC	NO	AMBIENT SANDY MUD>P; DISTD AMPS; DEAD SCALLOP SHELL; SHELLS/PIECES; SHELL FINES @ Z
WR-4	D	8/13/2000	14:19	ST_II	2	>4	>4	0	0	7.64	8.85	1.21	8.24	7.64	8.85	8.24	0	0	0	0.71	4.67	3.11	0	8	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & DECAYING AMPS; AMPELISCA; SHELL FINES @ Z
WR-4	E	8/13/2000	14:20	ST_II	2	>4	>4	0	0	5.44	6.43	0.99	5.93	5.44	6.43	5.93	0	0	0	0.77	5	2.75	0	7	BIOGENIC	NO	AMBIENT SANDY MUD>P; SHELLS/PIECES; DECAYING AMPS; SHELL BITS/FINES @ Z; THICK ORG DETRITUS
WR-4	F	8/13/2000	14:21	ST_II	2	>4	>4	0	0	5.6	6.54	0.93	6.07	5.6	6.54	6.07	0	0	0	0.77	5.55	3.25	0	8	BIOGENIC	NO	AMBIENT SANDY MUD>P; DISTD AMPS; SHELLS/PIECES; JUVENILE MUSSELS @ RT.
WR-5	A	8/13/2000	13:53	ST_II	2	>4	>4	0	0	12.58	13.19	0.6	12.88	12.58	13.19	12.88	0	0	0	0.05	2.47	1.14	0	5	BIOGENIC	NO	AMBIENT SANDY MUD>P; ACTIVE & DECAYING AMPS; SHELL BITS & FINES @ Z
WR-5	B	8/13/2000	13:54	ST_II	2	>4	>4	0	0	11.43	12.14	0.71	11.79	11.43	12.14	11.79	0	0	0	1.92	5.44	4.19	0	9	BIOGENIC	NO	AMBIENT SANDY MUD>P; JUVENILE & ADULT AMPS; SHELL BITS; JUVENILE MUSSELS
WR-5	C	8/13/2000	13:55	ST_II	2	>4	>4	0	0	9.78	12.42	2.64	11.1	9.78	12.42	11.1	0	0	0	0.05	5.71	3.36	0	8	BIOGENIC	NO	AMBIENT SANDY MUD>P; DECAYING AMPS; SHELL BITS/FINES THROUGHOUT; WORM@Z
WR-5	D	8/13/2000	14:13	ST_II	2	>4	>4	0	0	11.43	12.53	1.1	11.98	11.43	12.53	11.98	0	0	0	1.48	6.32	3.49	0	8	BIOGENIC	NO	AMBIENT SANDY MUD>P; JUVENILE AMPS; SHELL BITS & FINES THROUGHOUT SED
WR-5	E	8/13/2000	14:14	ST_I	2	>4	>4	0	0	11.21	12.86	1.65	12.03	11.21	12.86	12.03	0	0	0	0.05	6.48	2.76	0	5	BIOGENIC	NO	AMBIENT SANDY MUD>P; DECAYING AMPS; RETROGRADE SUCCESSION; SHELL PIECES; THICK DETRITUS
WR-5	F	8/13/2000	14:15	ST_II	2	>4	>4	0	0	10.16	10.66	0.49	10.41	10.16	10.66	10.41	0	0	0	0.6	5.27	3.41	0	8	BIOGENIC	NO	AMBIENT SANDY MUD>P; JUVENILE AMPS; SHELL BITS; SHELL BITS & FINES @ Z